IRON AGE

THE NATIONAL METALWORKING WEEKLY A Chilton Publication APRIL 6, 1961

★ Welding Show Feature:

Welding Meets Challenge Of Space-Age Metals p. 99

Are Trade Schools Lagging? p. 65

Steel Earnings in 1960 p. 76

Digest of the Week p. 2-3

if you can't tolerate seizing and galling

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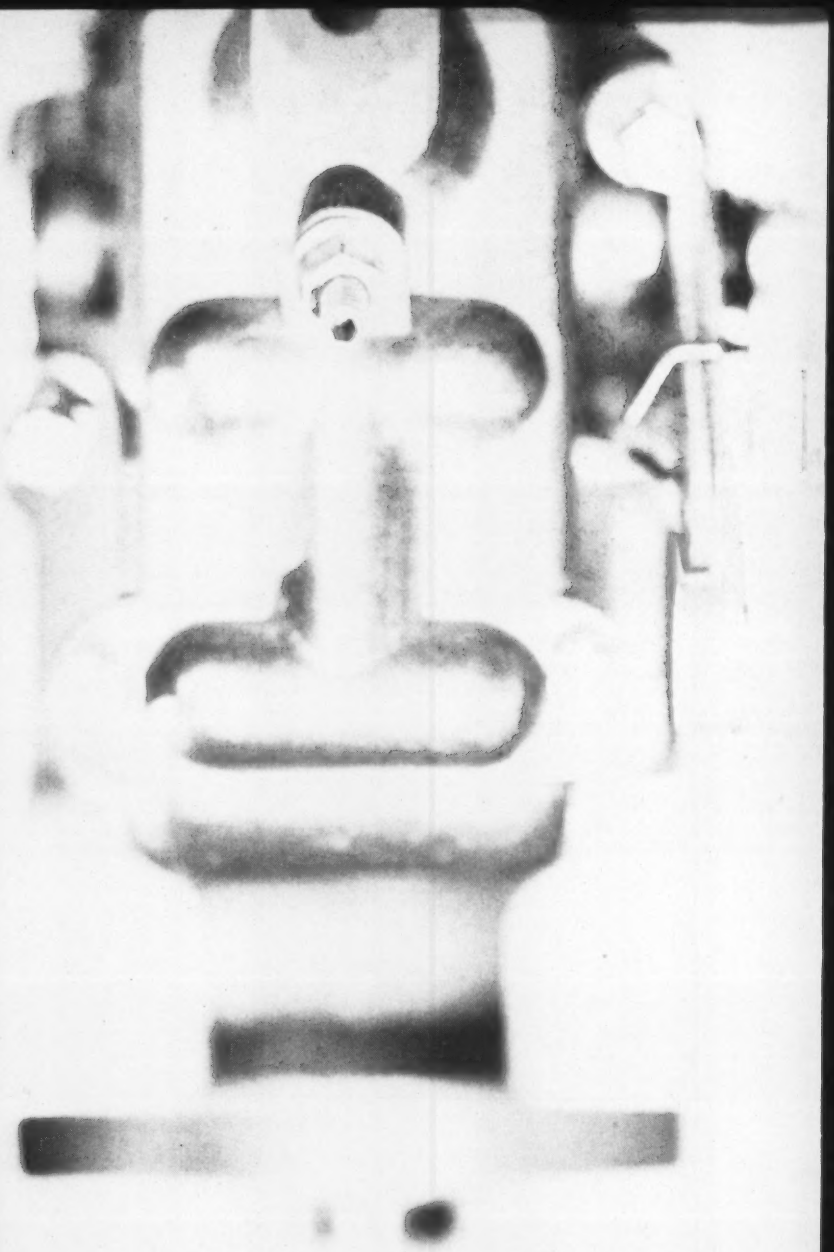

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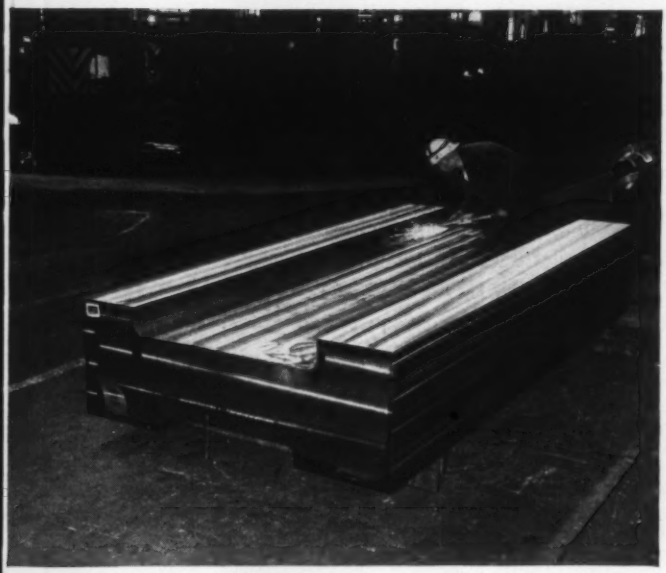
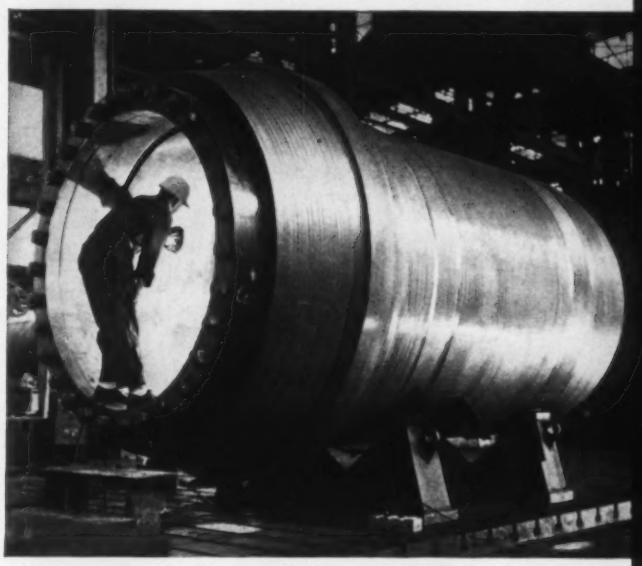
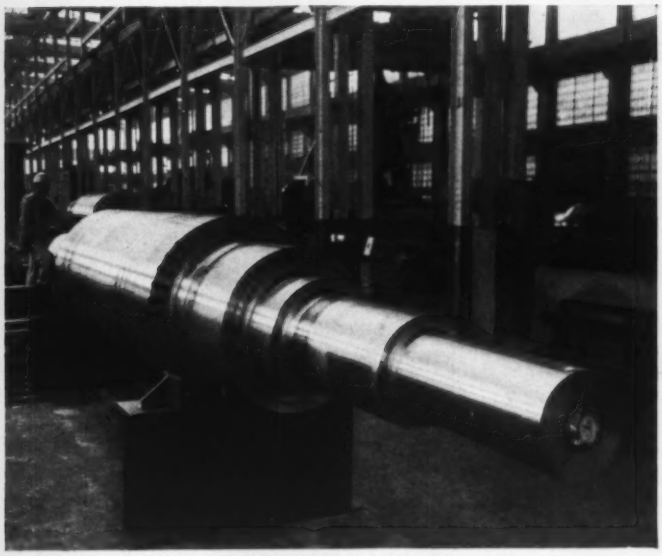


RAM ADAPTER. This forging weighs 58,780 lb, and measures 140 in. x 73 in. x 25 in.



STEEL CYLINDER for use in 7,500-ton plate stretcher. This forging weighs 171,240 lb, and it's 17 ft, 3 in. long.



GENERATOR SHAFT. Weight, 198,240 lb. As you can tell from these photos, Bethlehem is well-equipped for machining.

REACTOR VESSEL CLOSURE. The OD of this 50,660-lb forging measures 12 ft.

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Special This Week

How to Join Reactive Metals

Space age designers are watching progress in welding like hawks. The sooner a reactive metal can be welded, the sooner it moves into service. Engineers have devised several ways to weld such metals. You name it: tungsten, beryllium or columbium. The secret is to keep contaminants away from the welds. p. 99

Trade Training Gap Must Be Closed

About 26 million new young workers will enter the labor force during the 1960's. But will many of them be poorly-trained and poorly-educated? The nation's vocational schools are moving to meet the problem. But much must be done. p. 65

Japan's Raw Materials Problem

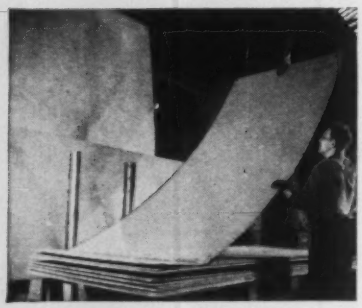
If Japan is to reach its industrial goals, it will have to fill a tremendous gap in raw materials. Right now, big ventures are planned to assure a long-term supply of ore and coal. Dependency on scrap imports may ease. p. 72

Next Week

An Interview With Robert Kennedy

Attorney General Robert F. Kennedy has adopted a tough attitude on enforcement of anti-trust laws. In an exclusive interview, he discusses mergers, price fixing, pre-merger notification and business' role in antitrust enforcement.

BUYERS' GUIDE . . .
to Ryerson service on stainless



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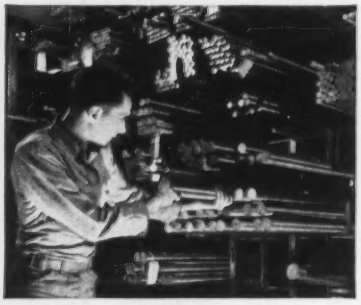

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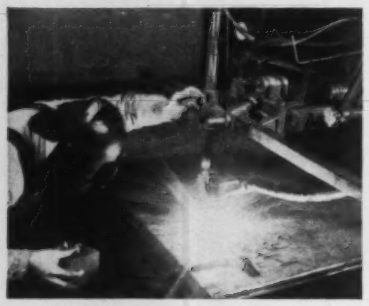

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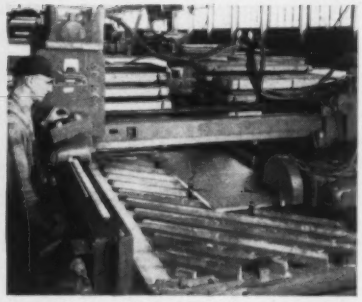
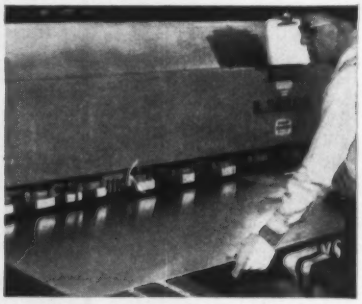


TRUE-SQUARE ABRASIVE CUTS—Stainless plates to 12′ x 25′ cut true square on abrasive disc machine. Length and width tolerance plus or minus 1/32″.



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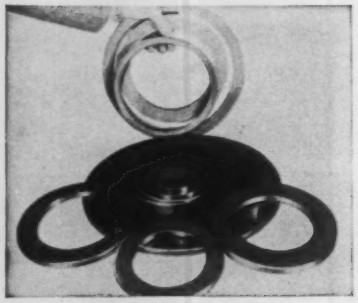

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Report From the Far East

International Trade: It Is a Complex Matter!

There is no question about it: America is far more blessed than most of us know. In foreign trade we have been most fortunate. Often in the past our exports have been the difference between boom and bust.

Now things are different. We will probably export $20 billion worth of goods this year and import no more than $15 billion. But that's not the whole story. Some sections of our economy are being hit by the imports: Many others are not. But in the past we took it for granted that other nations had to buy our materials, our products, our technical assistance, and our way of doing things.

There have been vast changes taking place. Most of us have given them little thought. It is true that we helped out with the original Marshall Plan; that we have been generous with our foreign aid. But that is something foreigners view a little differently from us.

Take Hong Kong, for instance. Papers there watch every move made by our unions and by our Congress when the question of textile exports from Hong Kong and Japan come up. And why not? It won't do any harm for us to realize a few things, even though we may establish quotas and generally curse the import trends.

Americans who drop off in Hong Kong or Japan for a week or so and harp on voluntary quotas for textile and other exports to the United States had better have their facts or else keep quiet. Coming to a foreign country and telling people where they ought to sell, how much they ought to sell, and how they ought to sell, is risky. Especially so when these nations and areas must trade to live.

Hong Kong has had a sad experience. It arbitrarily cut textile exports to the United Kingdom and what happened? The cut was taken up by Spain and by Yugoslavia. The Lancashire workers benefited not a bit.

When Japan voluntarily cut back its exports to the U. S., what happened? Last year, the Japanese share of the cotton fabric market was less than 20 pct. At one time it was 75 pct. When the cuts were made the slack was picked up by Hong Kong, India, Pakistan, South Korea, Taiwan, and Egypt!

The main thing we have to think about as we argue, debate, and make decisions about our foreign trade relations is this: We can no longer expect to export far more than we import. Nor can we expect other nations "on the march" to favor us just because we are Americans. We have to do a little work on our own.

Tom Campbell

Editor-in-Chief

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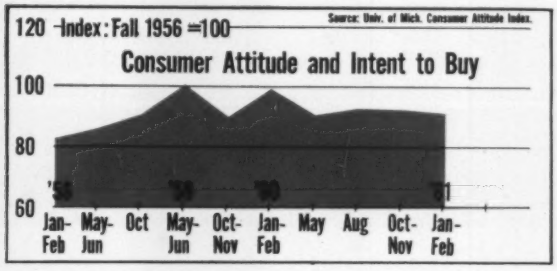
INLAND

What Will Provide the Momentum?

It's apparent that the economy has seen its worst, at least of the recent setback. Most businesses are edging up and March business statistics will probably



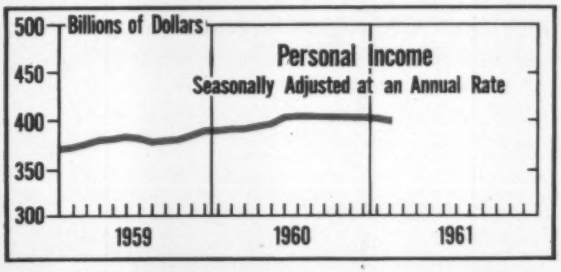
show some modest improvement. But, as yet, there is no single, big influence in view that is likely to create a real upward momentum.

This conclusion is supported by the latest Survey of Consumer Finances by the Survey Research Center of the University of Michigan. The survey indicates, on the good side, that consumer sentiment has not changed significantly for the worse, although buying intentions reflect uneasiness about personal finances and current business trends. "In a cautious frame of mind," is the way the buyer is characterized, and "not on a mood to step up spending, thereby initiating a business recovery."

The Center's Index of Consumer Attitudes slipped during the January-February period, to 91.8. (Fall 1956 = 100.) For the comparable period in 1960, it stood at 99.3.

Income Holds Up—With Help

Personal income remains relatively high, at $406 billion seasonally adjusted annual rate. But transfer



payments take in a greater share. According to the Dept. of Commerce, transfer payments are running at about 31.1 pct of the total. This compared with 27.9 pct a year ago.

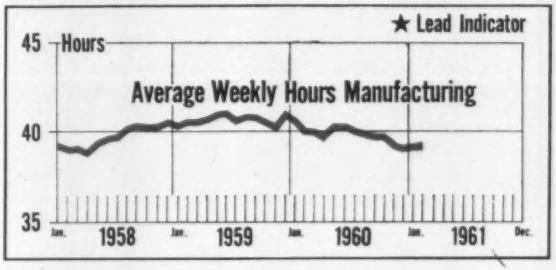
What are transfer payments? They include unemployment insurance benefits, civilian retirement benefits, special and general assistance, veterans' benefits. All of these rise in times of recession and take some of the sting out of the overall drop in earned income. Most of these payments tend to be spent immediately, therefore helping to sustain demand.

Pipeline Projects Pile Up

The log-jam of pipeline projects before the Federal Power Commission seems as tight as ever. According to one prime source, not a single project has been approved this year and the commission's backlog now totals about $800 million. The many suppliers affected wonder when the Administration will act on price regulation policies and take other steps to get the badly needed jobs in motion.

Factory Workweek Holds Its Ground

Although unemployment continues to climb, weekly work hours are edging up. From 38.9 hours per week



for production workers in January, the average workweek moved up a bit to 39 even in February. The workweek had dropped to 38.3 hours in December and now may be headed for a period of gradual improvement.

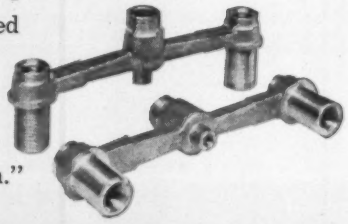
Foreign Cars Still Like U. S.

In spite of the impact of compacts and other factors, European automakers have not given up on the U. S. market. Speaking for Renault Inc., executive vice president V. P. Grob says he believes the market for imports here will be from 300,000 to 500,000 annually.

At the January level, imports are running at the low end of the spread. R. L. Polk figures show registration of 25,595 imports in January, the seventh consecutive month of decline. In January, 1960, the figure was 40,420.

WANTED! *Production line economies for market exploration...*

At Bardes Corporation in Cincinnati, Milt Garvin, Vice President, talked over this problem with his Cincinnati Lathe and Tool distributor. "We continually develop new plumbing products—like this faucet body which has 30 operations including drilling, hollow milling, boring, tapping and threading. We'll use a transfer machine when we hit high volume. Right now we need a machining line for low-cost, diversified small-lot production."



DELIVERED! *A low-cost machining line from standard machine tools...*

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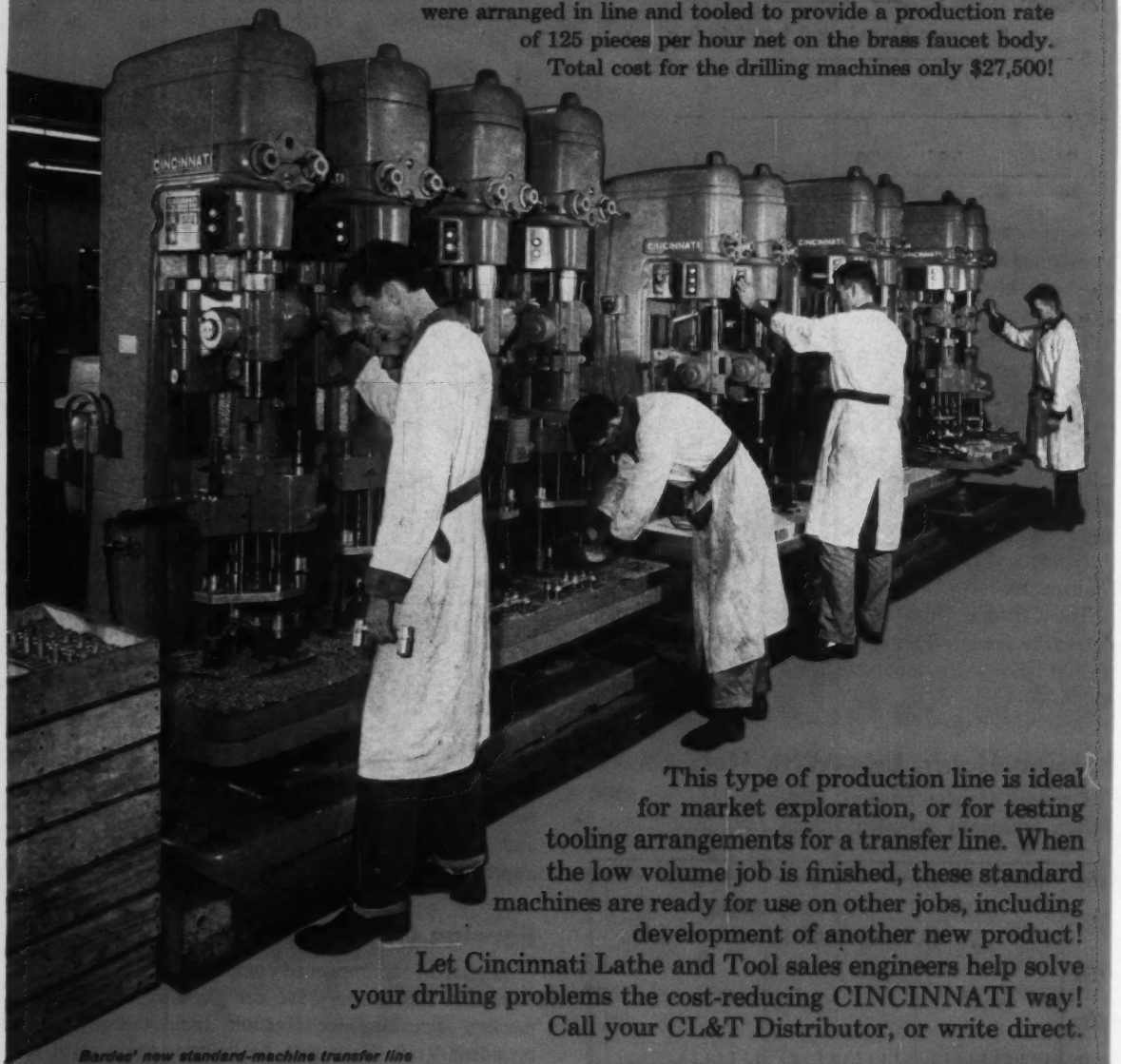

This type of production line is ideal for market exploration, or for testing tooling arrangements for a transfer line. When the low volume job is finished, these standard machines are ready for use on other jobs, including development of another new product!

Let Cincinnati Lathe and Tool sales engineers help solve your drilling problems the cost-reducing CINCINNATI way! Call your CL&T Distributor, or write direct.

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Automation Hearings: Steelmaker Testifies

Steel industry management foresees no **"overall technological unemployment in the future."**

In fact, management is on record with the U. S. Congress as believing that **"tragic new trends of technological unemployment do not exist."**

COOPER & HOLLAND

Management was put on record by R. Conrad Cooper, executive vice president of the United States Steel Corp. Mr. Cooper testified for his company before the House Subcommittee on Unemployment and the Impact of Automation. As chief negotiator for the companies during the 1959 negotiations, he also spoke for the steel industry.

Earlier this month the subcommittee heard David J. McDonald, president of the United Steelworkers (IA—Mar. 16, '61, p. 79).

Mr. McDonald had blamed much of steel unemployment on automation. Mr. Cooper blames automation very little.

"The problem of unemployment in steel results primarily from cyclical rather than technological causes," he told the committee.

Under questioning from the subcommittee chairman Rep. Elmer J. Holland (D., Pa.), and other members of his committee, Mr. Cooper went further. He said automation will cause no great unemployment problems in the steel industry in the future.

In relating present unemployment to the business cycle, the U. S. Steel executive blames it **"almost entirely"** on the **"lack of orders for steel products, resulting from a combination of competitive factors at home and abroad, strike influence, inventory accumulations and liquidations, and the general economic situation of the country."**

However, Mr. Cooper does not dismiss the problem of unemployment caused by automation.

"While it is true that there is no over-all long-term technological unemployment problem in steel, specific instances of employment dislocations due to technological improvement do and must occur."

Rep. Holland suggests that perhaps the best answer to unemployment problems is some sort of government control, particularly in the case of automation.

Mr. Cooper is having none of it. He warns that government action to stem technological unemployment might cost so much it would hinder further industrial expansion. And, he says:

"Let us not lose sight of the fact that probably the most powerful remedial force we have, or ever shall have, lies in the actions which the affected individual himself contrives and carries out."

USWA: Defends T-H Act

The United Steelworkers of America are hailing their "victory" in the 1959 steel strike in a booklet entitled "The 1959 Steel Strike." The union defends President Eisenhower's use of the Taft-Hartley injunction which forced workers to return to their jobs.

And the union is telling its story in five languages. In addition to English, the booklet is published in French, German, Japanese, and Spanish. The purpose is to refute charges made to the International Labor Organization by the Communist-controlled World Federation of Trade Unions.

WFTU has complained that the injunction violated the ILO's convention on freedom of association.

In defending the government's conduct, the union says:

1. The strike was permitted to go on for 116 days without interference.

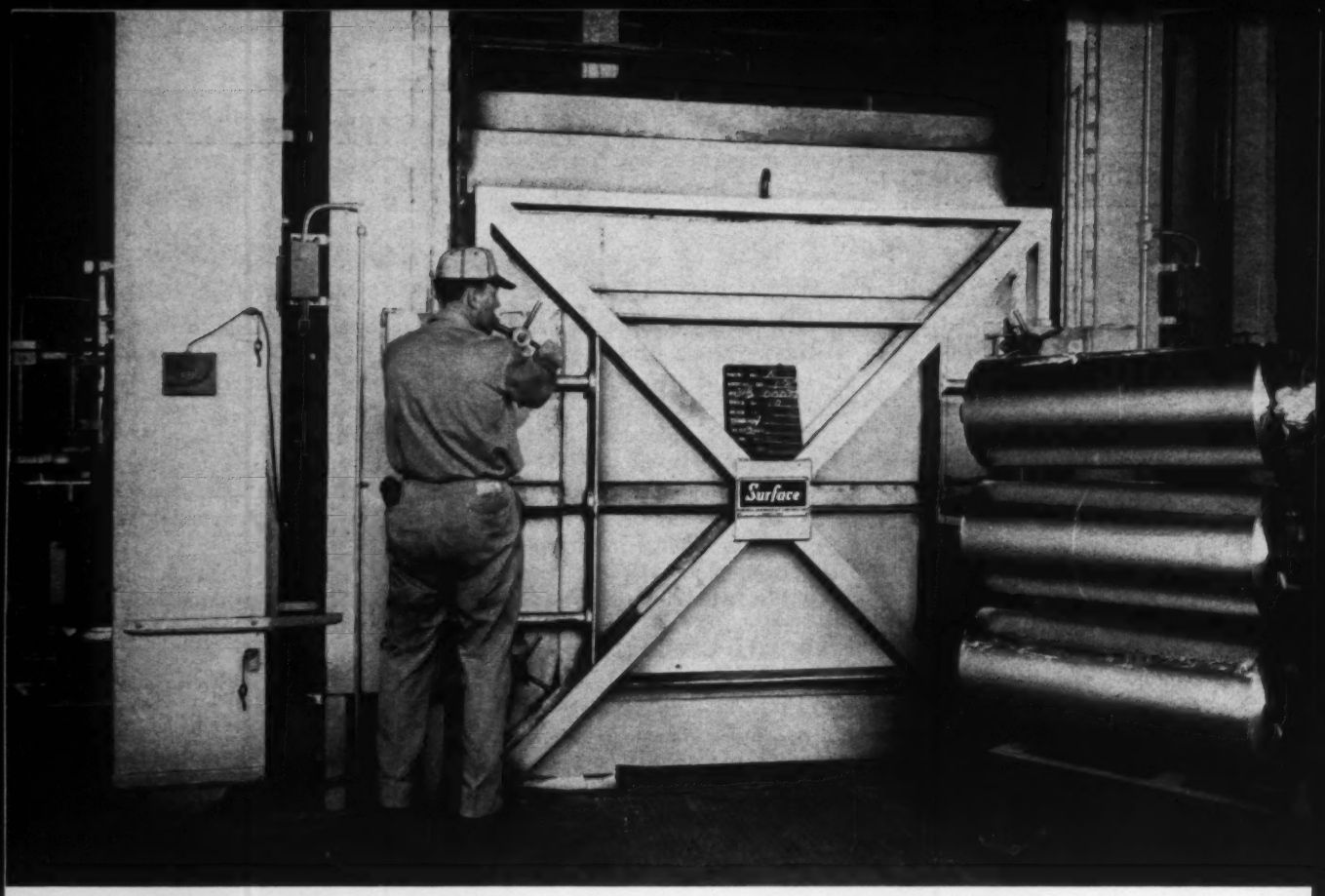
2. When the government did intervene, it did so under a law which established prescribed limitations and procedures.

3. Orderly processes were applied, and the union was accorded its full legal rights.

4. No criminal action was taken against the union, its officers, pickets or members.

5. When the injunction went into effect, it required resumption of work for 80 days under the old agreement.

While the booklet is less than flattering in its comments on steel industry management, the union leaves no doubt that it much prefers to do business in the U. S. than anywhere else.



ANACONDA ALUMINUM ANNEALS FOIL WITH LOW-COST UNIFORMITY

in Surface Power Convection Furnaces

Phenomenal temperature uniformity (never varying more than 5°) and low costs are the profits earned by Anaconda Aluminum with four of these Surface Power Convection furnaces in their Louisville plant.

Each furnace anneals an 8,000-lb. load of coiled aluminum foil in a seven-hour heating cycle. Coils are stacked on racks, as you see here, and fork-lifted directly into the furnaces. Surface DX® generator gas protects the foil during the cycle.

Power Convection* equipment simplifies furnace construction,—just one fan, minimum furnace size for its capacity. This reduces both first cost and operating maintenance. For more data on Surface Power Convection equipment write for Bulletin SC-182. Surface Combustion, 2373 Dorr Street, Toledo 1, Ohio. In Canada: Surface Industrial Furnaces Ltd., Toronto, Ontario.

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MR

★What's in Defense Budget

President Kennedy's overhaul of the nation's defense spending plans sets industry up for a period of missile building as never seen before. But it also makes a place for industries producing conventional equipment for the nation's military machine.

For 1962 and the future, the President's new defense budget will sink $2 billion more into defense spending than former President Eisenhower proposed just before leaving office.

Increased spending for fiscal 1962 only amounts to $650 million of the total $43.8 billion Defense budget.

President Kennedy overhauled the spending plan on two main concepts:

To develop a missile and bomber retaliatory force to retaliate against a surprise nuclear attack "with devastating power."

To strengthen the limited war forces with new conventional weapons, a new type of short-takeoff fighter plan, better airlift capabilities, and equipment for guerilla-type warfare.

The accent on the program is missile power. The President plans to arm the nation with more than 1300 ballistic missiles by 1965.

Top spot in the program goes to the Polaris missile and its nuclear-powered submarine. The Chief Executive calls for assembly-line production of the sub, reaching a one-a-month rate by mid-1963. More than half of his $2 billion increase will go to the Polaris.

Other missile plans call for expanded production of new Minuteman missiles and the bomber-carried Skybolt missile.

But all plans are not increased. President Kennedy hopes to slash $430 million from present programs. He wants to kill the nuclear aircraft project, cut the B70 bomber plan drastically, and cancel two of 14 squadrons of Titan missiles.

Though the defense budget is the biggest since World War II, the President says still more may be needed in future years.

■ Will Census Report Be Confidential?

The Supreme Court will decide, once and for all, whether government trustbusters can look at businessmen's confidential reports to the U. S. Census Bureau.

The high Court has agreed to rule on a case where the Federal Trade Commission was denied the right to see a private company's report to the Census Bureau.

Just recently the Supreme Court refused to review a similar case.

The Court will look at the new case in its year-end session. At stake for businessmen is the possibility of having its own "share of the market" information used against it in antitrust cases.

■ Tax Incentives To Be Retroactive

Businessmen who are waiting for President Kennedy's tax incentive plan before they start new investment plans rolling need not wait any longer.

Though the tax program is still not formulated, the Administration promises the plan will be retroactive at least to March 1.

Stanley Surrey, the President's chief tax advisor, promises the program will cover new plant and equipment expenditures from March 1 and maybe even from Jan. 1.

Mr. Surrey says the tax incentive might be proposed on a permanent rather than a temporary system.

■ Bill Encourages Home Improvement

A new Administration housing plan now before Congress emphasizes restoration of old houses rather than new housing construction.

The $3.2 billion housing bill puts the accent on renovation of deteriorating but basically sound older houses in big cities.

The money would be spent over 40 years, but most of it by 1970. For the year beginning July 1, it would add about $300 million to the $728 million in housing outlays budgeted by former President Eisenhower.

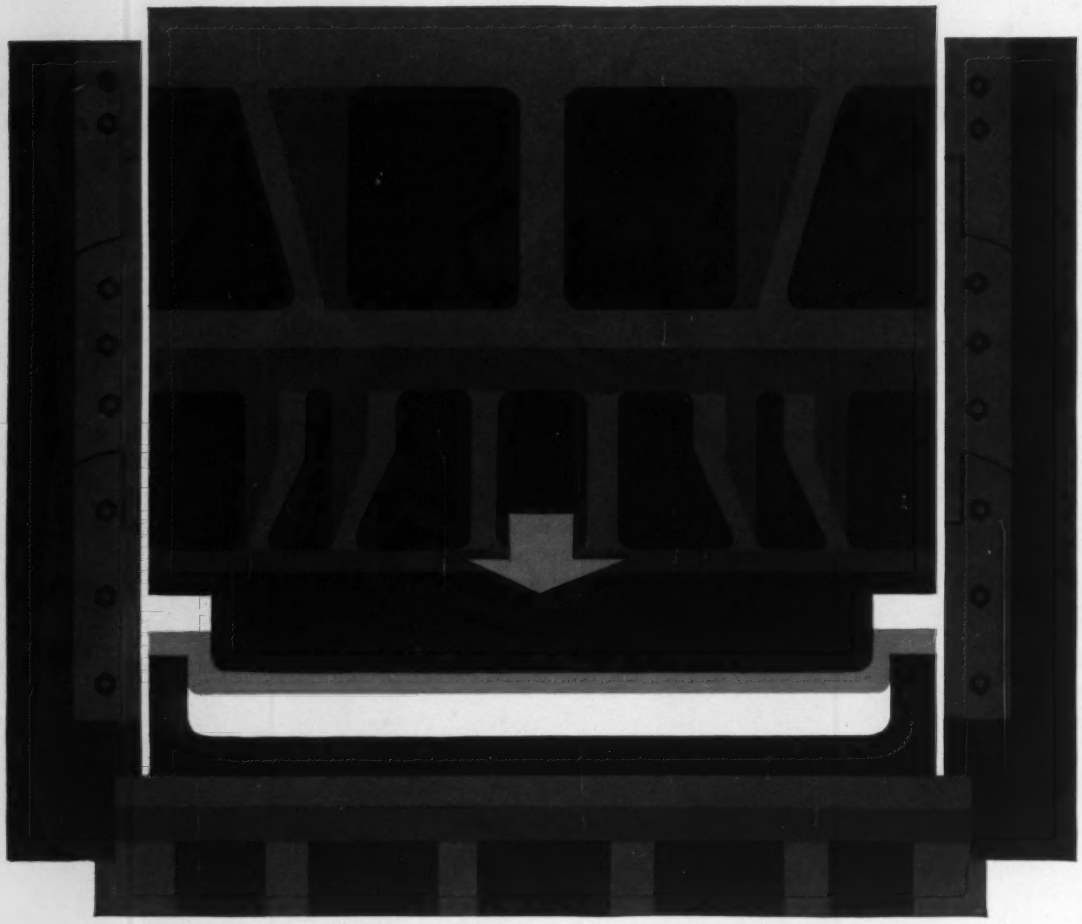
■ Consumer To Get Official Recognition

A government spokesman for the consumer is a sure thing.

President Kennedy is setting up a White House office to represent consumer interests. And congressmen are renewing efforts to give the idea more permanency.

Sen. Estes Kefauver, is putting his support behind legislation to set up a cabinet-level department of consumers. Sen. Maurine B. Neuberger, (D., Ore.) has introduced legislation to set up a special Senate Committee on consumers.

The President's consumer's council will represent consumer interests in proceedings before regulatory agencies as well as in the formulation of broad economic policies.



Cut drawing costs with the Pennsalt System Approach

For new economies in metal processing, see what the Pennsalt System Approach can do in your plant. Because we make both chemicals and equipment, we can engineer them to work together for peak production, highest product quality, lower chemical and labor costs on your line. Take cold-forming and deep-drawing, for example:

The materials. Alkaline cleaners for preparing stock before applying lubricant; Foscoat® and Fosbond® pre-lubricant coatings. Dry-at-the-press Foslube® cold-forming lubricants; Drawcote® deep-drawing lubricants. Cleaners for removing lubricants before subsequent finishing or annealing. Strippable vinyl coatings for protecting finished parts.

The machines. Multi-stage Drawcote automatic machines for spray or roller coating; automatic tank and spray washers; drying ovens; immersion tanks for dip coating—custom-engineered to your production requirements.

Other "work-together" combinations from Pennsalt include over 40 types of cleaners for all metals, and the tank and power spray washers; pickling compounds, and automatic pickling machines; Fosbond phosphating products, and automatic phosphating machines.

Personalized service. Trained specialists from our nationwide field organization analyze your process requirements, help with installation and start-up, then follow up with regular service calls to keep your finishing line running at peak efficiency. Call or write for a consultation, and for our free booklet, "The Pennsalt Metal Preparation Service Plan."

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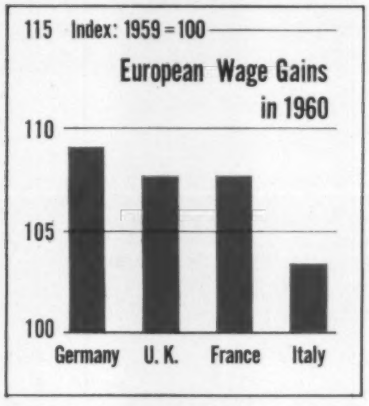
European Wages Keep Rising

European wages continue to rise. And now foreign businessmen are beginning to worry about a profit squeeze.

Wages in Germany rose 9 pct last year. Workers in England and France drew gains of 7.5 pct. In Italy, industrial wages rose 3.2 pct. However, European wages are still



far behind the spiralling U. S. levels (IA—Dec. 22, '60, p. 13).

The biggest reason for the European wage gains is a shortage of workers. Industrial production in the Common Market rose 12 pct in 1960. The ratio between production and workers is widening. A recent issue of FRANCE ACTUELLE, for example, says: ". . . there are more than 30,000 good jobs (in France), mostly for skilled workers, unfilled."

The French magazine also notes that the average worker is putting in 46 hours weekly. He draws overtime pay for work above 40 hours.

Housing Boom Comes to Russia

Industrial automation has triggered a housing boom in Russia. That's the word from Prof. Julian Saushkin of Moscow Univ.

Prof. Saushkin told students at the Univ. of Michigan recently that "automation and electrification of production in Russia ensure a great increase in the productivity of labor." He says this has resulted in a "tremendous" boom for the construction industry.

According to the Soviet educator, 18 new apartments per 1000 inhabitants are constructed in Moscow annually. "The construction of new cities—satellites of Moscow—is beginning."

World Trade Fair

The newest metalworking machines from Free World nations will be displayed at the U. S. World Trade Fair this year. The display is scheduled for the New York Coliseum, May 3 to 13.

Executive Warns Of European Progress

An American steel executive says the U. S. is just beginning to feel the effects of European industrial growth.

George McCuskey, vice president, finance, Youngstown Sheet and Tube Co., made his comments at a meeting of the Northern Ohio Section, American Institute of Mining, Metallurgical and Petroleum Engineers recently. His remarks were based on several trips to Europe and a study of the steel industry there.

Says Mr. McCuskey: "Without intending to be an alarmist, I can't help but feel that unless we soon recognize our deteriorating international economic status and are willing to undertake the disciplines necessary to improve our position, we will discover that we have had our 'golden years.' . . ."

He also notes that "We must reckon with the day when the new European capacity is equal to, or exceeds, local requirements."

Exports Rise

According to the Japan Steelmaker's Federation, steel exporters shipped 2.5 million tons in 1960. Revenue from this was $248 million. This shows a 39 pct gain in shipments over 1959's level, and a 47 pct rise in revenue.

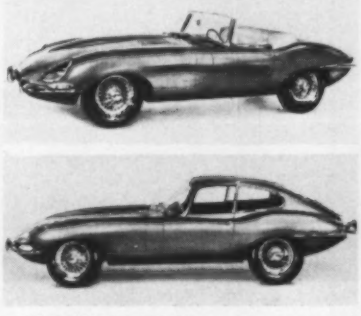
Jaguar Introduces 'Speed' Models

Though Jaguar sales continued to rise last year, profits dropped.

Now the British automaker has unveiled its latest models—with hopes they will close the profit gap. The U. S. unveiling was held in New York last week.

The new cars, known as XK-E Roadster and XKE-Coupe, are tagged as the "fastest production sports cars ever offered for public sale." Jaguar says the models are capable of speeds of 150 mph.

According to company officials, the big reason behind the profit drop last year was the Mark II model. This line was introduced in 1960 at the price of the Mark I. Yet production costs are substantially higher.



NEW JAGUARS: Road to profit?

The automaker notes exports still take more than 60 pct of output. But the U. S. market has not expanded since 1955. However, the U. S. still buys 20 pct of Jaguar's production.

NEW WAY TO TEST YOUR PRODUCTIVITY

Now, Rotor Field Engineers can come into your plant and give you a far more complete testing of your air grinder productivity.

The new Rotor Portable Tool Comparator shown in use, measures efficiency under load conditions. Hence, it permits a far more practical appraisal of your productivity. This new method gives factual data for decision to repair or replace existing tools and whether new tools will pay for themselves.

Your Rotor Field Engineer will bring a Comparator Kit into your shop for a productivity test of your air grinders, or show you how to do this yourself. Write for your "Portable Tool Productivity Analysis". There is no obligation. The Rotor Tool Company, 26300 Lakeland Avenue, Cleveland 32, Ohio.

Floyd L. Paschke (right), Sales Manager, Rotor Tool Company, demonstrating use of the Comparator.

Is your grinding productivity up to PAR?

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Special Tools • Air Motors

ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

Japanese Steelmaking

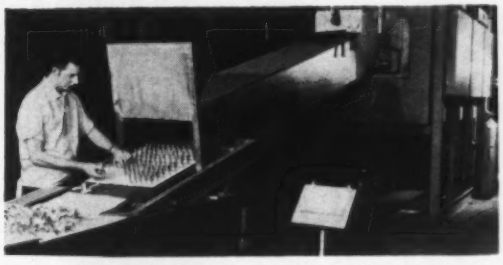
In the next decade, Japan's steelmakers expect to more than double their present output of 22.1-million metric tons. Most of the gain will result from new LD oxygen-steelmaking plants. Last year, Japan exported more than 10 pct of her raw steel. There will be no change in export tonnage by 1970. Instead, the Japanese hope to export more manufactured products.

Improved Aluminum Sheet?

A major aluminum producer is switching to continuous casting as part of a system for making various light-sheet forms. Small aluminum blanks for beer cans are now being made on one continuous-casting line. Future lines will turn out conventional sheets and coils for can stock and other thin-material products.

Paper Aids Brazers

At 2300°F, ceramic-fiber paper protects belts, fixtures and work in process in continuous high-temperature - brazing furnaces. Wrapping the work in paper insures a bright, uncontaminated finish. Brazing gases pass through the porous paper. During the cooling cycle, these gases recondense on the paper's outer surface. The paper also prevents the work from sticking to the furnace hearth or holding fixtures.



PAPER PROTECTION: Extends belt life.

Decisions on Tap

The experience and judgment of top executives may soon be canned for general use. One company is working on a program to determine how top men think: The aim is to duplicate this performance in a computer. First, the program will work up a system for screening data. Ultimately, says a backer, you'll be able to use this method to extend the judgment of a top executive or to reserve his experience for later generations.

Clean With Salt Spray

In metalfinishing, most people place salt spray on a par with the plague. However, these same people may soon use a continuous salt spray to clean and descale stainless steel strip, without marring the surface. This low-cost method will yield mar-free strip. A major improvement in the finish hinges on a new type of roller.

Hot-Milling Methods

After exhaustive tests, radio-frequency heating is ready to go into production shops. Missile and space plants are keenly interested. They plan to use hot-milling methods on die steels such as Thermold J or AM 350. Localized heating extends cutter use from 20-100 times the normal room-temperature life. The new methods can be used to fabricate complex shapes that were heretofore considered impossible to mill.

Stainless-Clad Aluminum

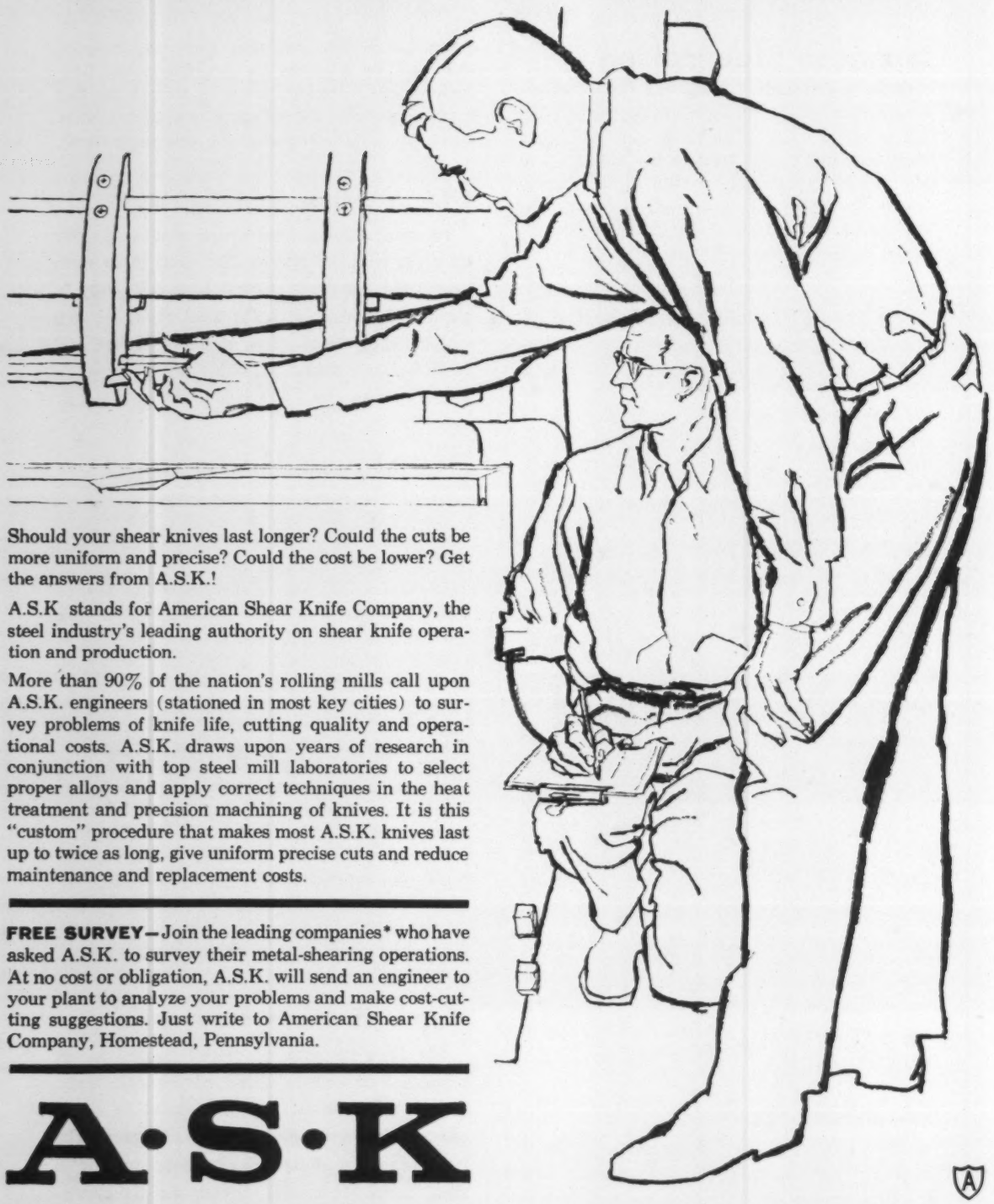
Molecular bonds secure stainless steel to aluminum sheet. This stainless-clad aluminum combines stainless steel's hard finish, strength, and resistance to corrosion and staining with aluminum's desirable features. The latter include lightness, heat conductivity and formability. Unlike the joining of aluminum to stainless by casting, the molecular bond actually unites the two metals.

Use Vibrating Electrode

The Russians have developed equipment for submerged arcwelding with a vibrating electrode. They're going to use this equipment to repair worn-out machine tools and other steel parts. The frequency of the electrode's vibrations varies from 20-57 cycles per second. Thickness of the evenly-deposited weld is 0.3-3.0 mm.

Can you get more wear from your shear knives?

A·S·K for the answer!



Should your shear knives last longer? Could the cuts be more uniform and precise? Could the cost be lower? Get the answers from A.S.K.!

A.S.K stands for American Shear Knife Company, the steel industry's leading authority on shear knife operation and production.

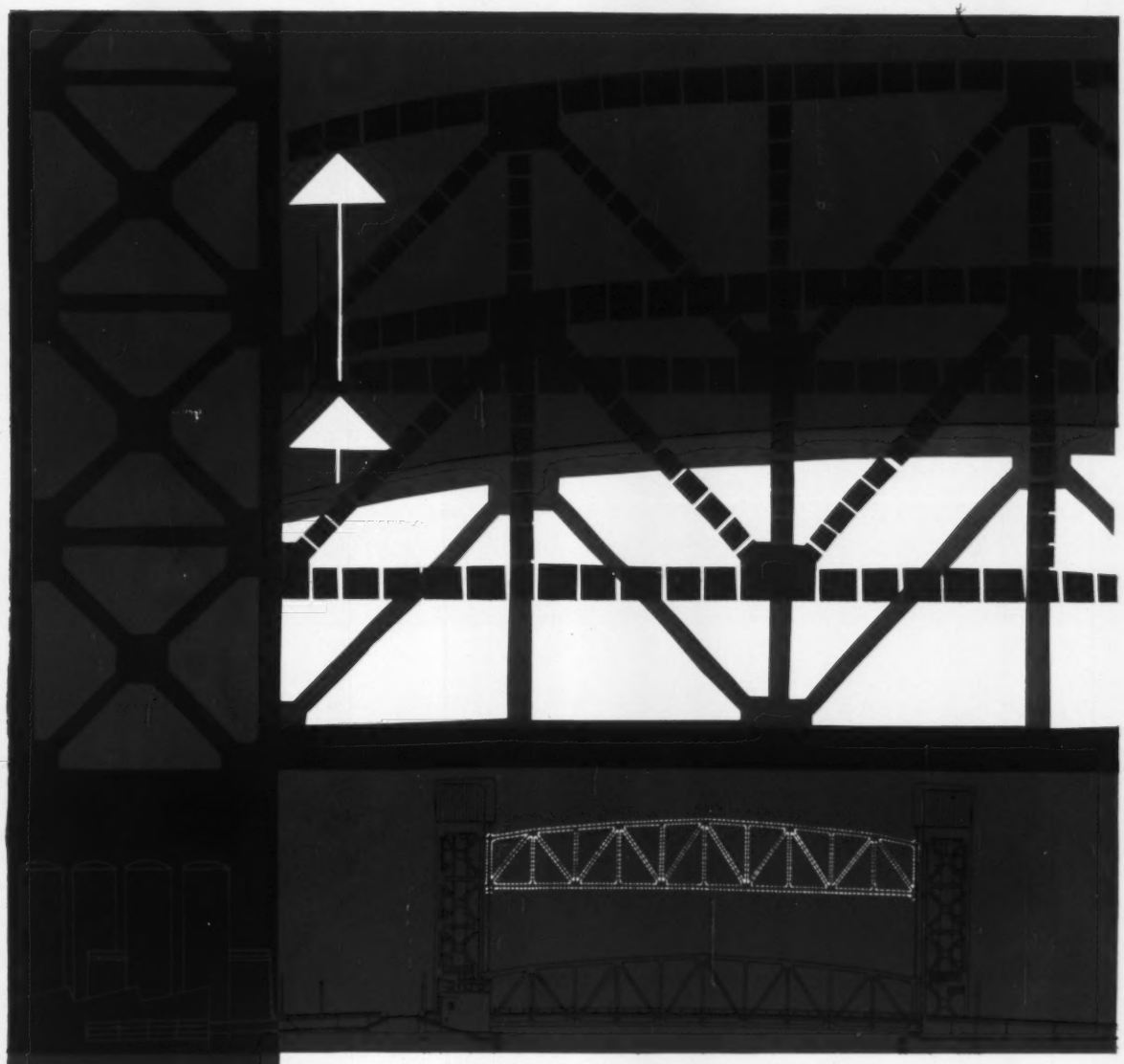
More than 90% of the nation's rolling mills call upon A.S.K. engineers (stationed in most key cities) to survey problems of knife life, cutting quality and operational costs. A.S.K. draws upon years of research in conjunction with top steel mill laboratories to select proper alloys and apply correct techniques in the heat treatment and precision machining of knives. It is this "custom" procedure that makes most A.S.K. knives last up to twice as long, give uniform precise cuts and reduce maintenance and replacement costs.

FREE SURVEY—Join the leading companies* who have asked A.S.K. to survey their metal-shearing operations. At no cost or obligation, A.S.K. will send an engineer to your plant to analyze your problems and make cost-cutting suggestions. Just write to American Shear Knife Company, Homestead, Pennsylvania.

A·S·K

AMERICAN SHEAR KNIFE

*names supplied on request



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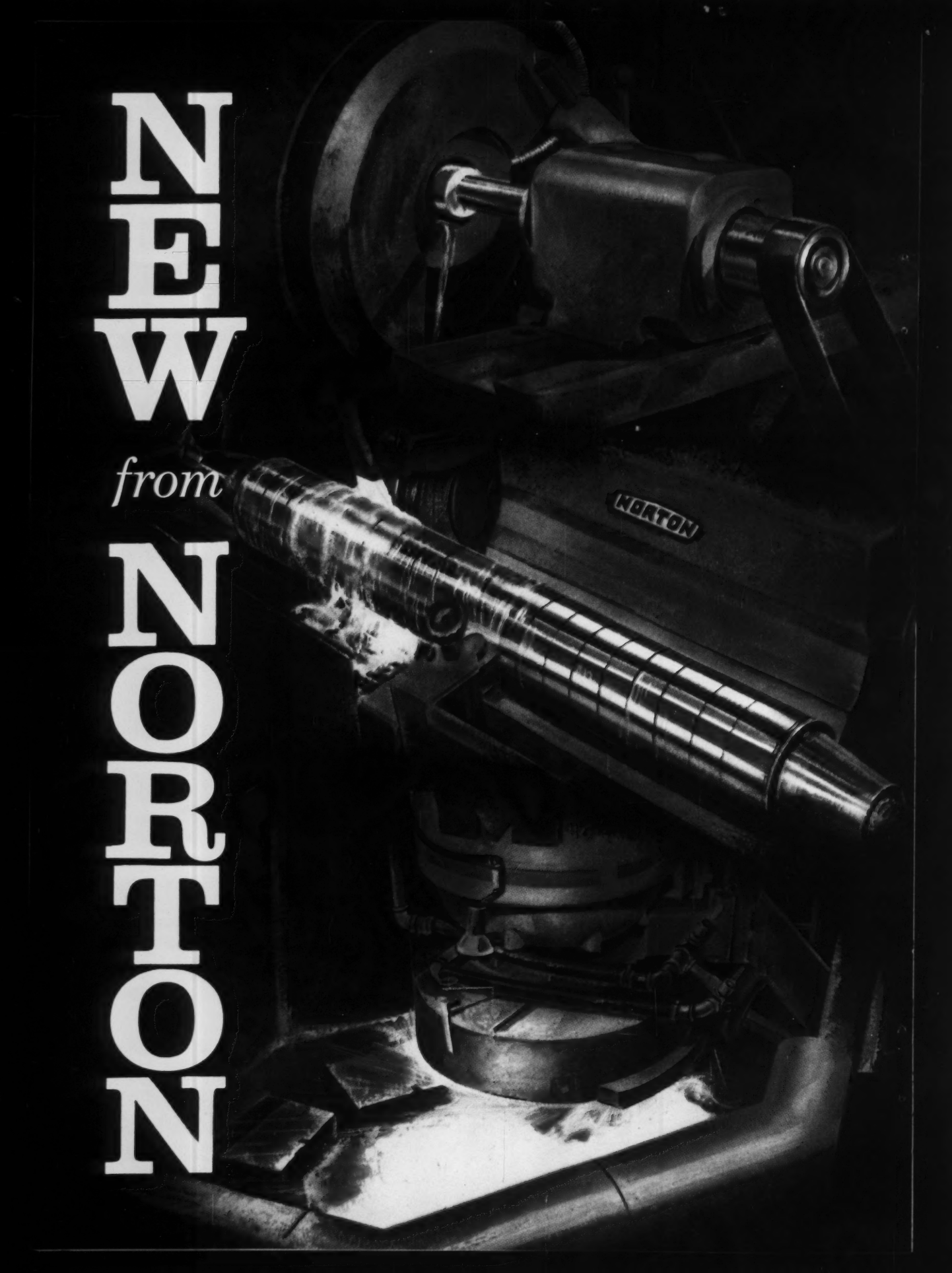
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23 ALUNDUM* abrasive
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The newest Norton development for production grinding is for production economy, too.

It's 23 ALUNDUM abrasive.

This is no ordinary aluminum oxide. Except for price — which is *non*-premium — 23 ALUNDUM abrasive is *premium* in every respect. It has premium toughness . . . premium sharpness . . . and free, fast, cool cutting action that means premium precision performance.

Other big advantages are friability, which minimizes dressing . . . precise duplication, which assures uniform performance . . . and versatility that includes grinding of all steels, boiler plate, cast iron, Meehanite, aluminum and many other widely varying metals.

All of which adds up to the proved premium value of 23 ALUNDUM abrasive — in the broadest range of production grinding. For example:

Surface Grinding. With the new 23 ALUNDUM segments and cylinders, users are getting freer cutting and higher production rate on large die blocks, high vanadium steel tool bits, attrition plates, high carbon steel knives, stamped metal parts and similar work.

Centerless Grinding. Excellent results on bar stock grinding for automotive parts of carbon and stainless steels, cast iron and other metals, hard and soft.

Cylindrical Grinding. Top quality, low cost volume production of high speed steel drills, reamers and taps, laminated armatures, cams, shafts, sleeves and valve stems.

Internal Grinding. Bearing races and bores, precision ground faster to tight limits and fine finish, with less wheel dressing. Reduced grinding costs on cylinder bushings, die holes, rocker arms and wrist pins.

That's just a brief outline of 23 ALUNDUM abrasive's advantages for production grinding.

You can *see* them in action, right in your own plant — you can watch 23 ALUNDUM wheels or segments adding new speed, accuracy and economy to your own production grinding.

Your Norton Distributor or your Norton Man will be glad to arrange a test run in your plant, with expert aid in wheel selection. See him soon. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

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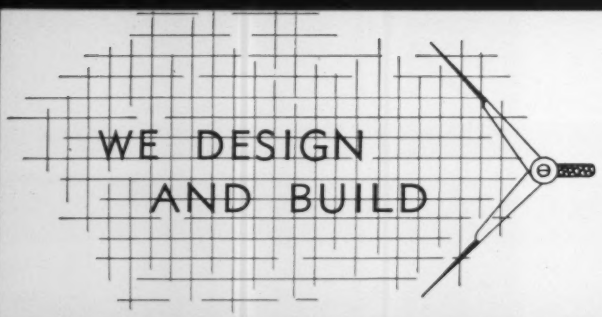
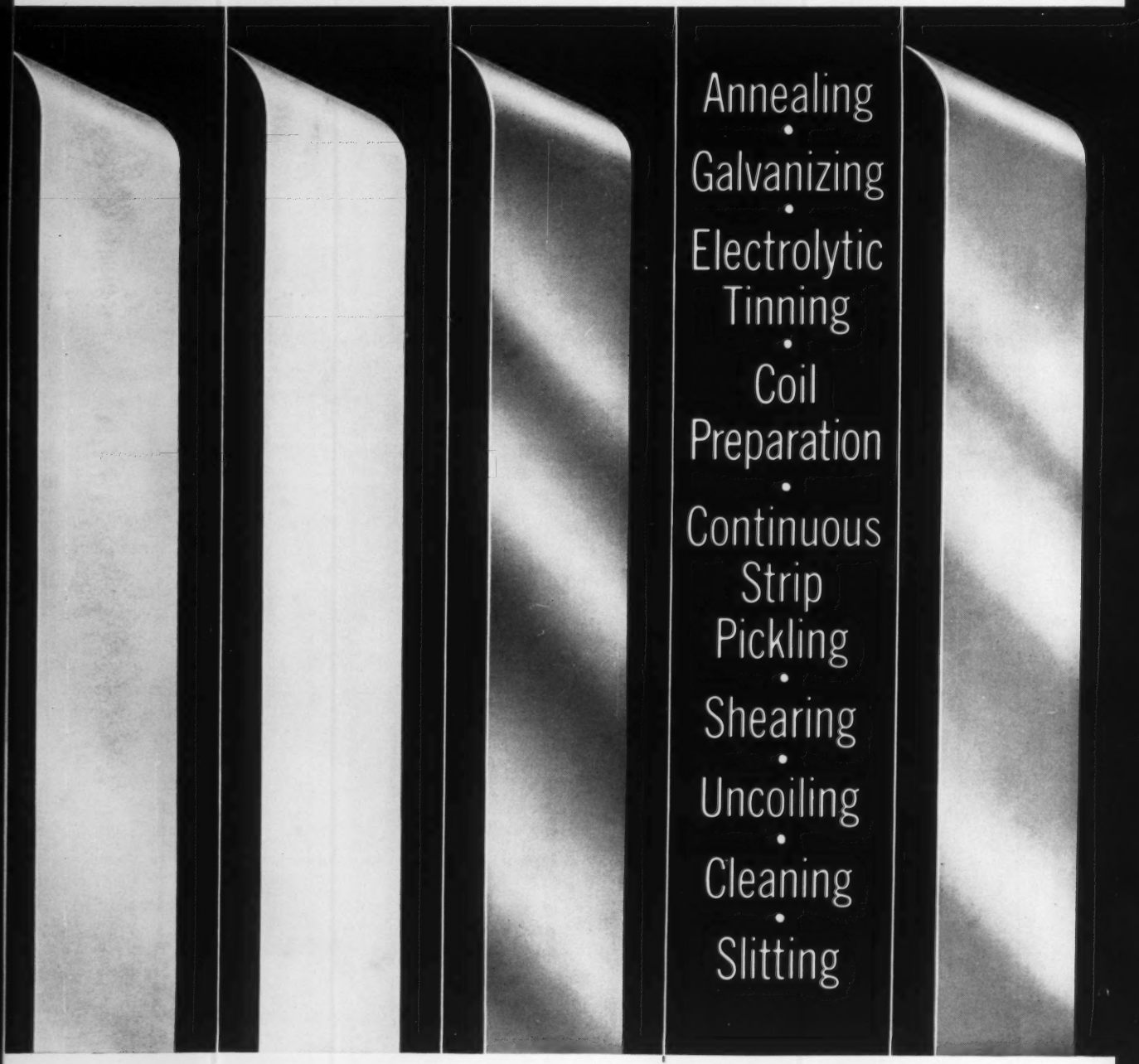


PROCESSING LINES

FOR SHEET AND STRIP



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Conflict of Interest?

Sir — Referring to The IRON AGE of March 16, p. 79, there is a picture of Steelworker's president David McDonald and Rep. Elmer J. Holland (D., Pa.) who is chair-

man of the House Subcommittee on Unemployment and the Impact of Automation. Mr. Holland is also a member of USWA. Isn't this "conflict of interest" in its worst form?—Charles F. Lewis, Cook Heat Treating Co., Houston, Tex.

▪ For more on automation and Rep. Holland, see p. 9.—Ed.

On Imports

Sir—In reporting on the effects of machine tool imports into the United States, you continue to stumble into the same trap time and again.

It has been my experience that this company's machine tools, all of them manufactured in Germany, are purchased because of sophisticated design or special accuracies and not because of price. This is exactly the same reason why foreign companies buy three times as much machinery from the United States as the U. S. imports.

I feel no one has a monopoly on know-how and while, for many applications in the consumer's field, it is of no concern to me how well or poorly a particular product is made, I feel that a certain responsibility exists where our defense establishment is concerned. We should be uncompromising in areas where accuracy is of great importance.

I often wonder why it takes so long to penetrate the editorial thinking of respected publications that trade, including foreign trade, is a two-way street. There has not been a single year on record with the Dept. of Commerce that the United States did not export a greater volume—in dollars—than it imported. The dollar deficit is not due to free trade and one of these days you will have the courage to admit it publicly.—Kurt J. Ucko, vice president, Kurt Orban Co., Inc., Jersey City, N. J.

▪ There seems to be a misunderstanding here. In the item mentioned, we were discussing whether the 5 pct revaluation of the German Mark might narrow the price spread between U. S. and German tools, both here and abroad. We've never blamed free trade for the balance of payments problem; we laid it (See IA, Jan. 19, '61, p. 52) to the dollars sent abroad for investment, tourism and foreign aid.—Ed.

"I like the down-to-earth way you've filled out this application. Too bad we're in the missile business."

THE INSIDE STORY

This P&K Microdrawn® tubing solved a serious fuel line corrosion problem in jet engines. The answer: seamless tubing microfinished internally by a special P&K process. No grinding or polishing . . . no cavitation or particle removal problems.

Posen & Kline produces Microdrawn tubing up to 5/8" OD in every conceivable finish, shape, tolerance, and ID to solve your tubing problems . . . satisfy demanding tubing needs.

Facts in Catalog 10. Posen & Kline Tube Company, Inc., Box 549, Norristown, Pa.

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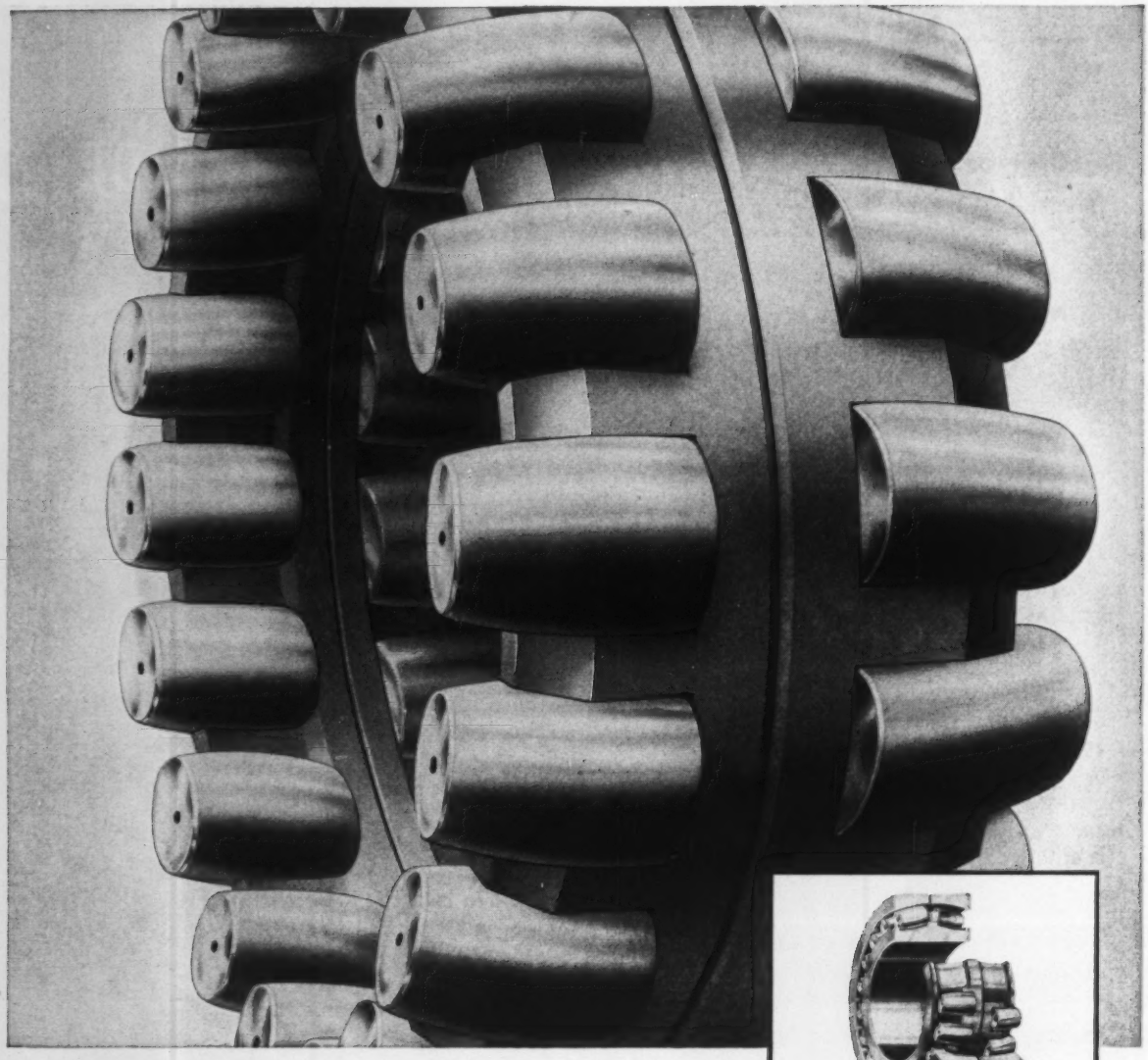
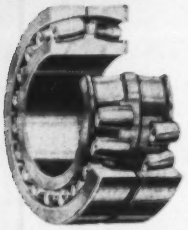


"Caged" for Longer Life!

The two land-riding cages in Torrington Spherical Roller Bearings assure proper roller spacing and guidance, even under rugged conditions of shock load and sustained high speeds. These fully machined cast bronze cages operate independently. Their design eliminates drag on rollers. These high-strength cages help bearings give longer life by providing low friction, smooth running and cool operation. Highly effective and generous lubrication of all contact surfaces is achieved with the open-end cage design.

The result: Torrington Spherical Roller Bearings are built to give extra years of unmatched service life in heavy-duty applications. Torrington's long experience in design, engineering and manufacture of every basic type of anti-friction bearing provides the finest spherical roller bearings available. You'll find it pays to standardize on Torrington.



Superior design features of TORRINGTON SPHERICAL ROLLER BEARINGS

- integral guide flange for roller stability
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- electronically matched rollers
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FATIGUE CRACKS

Space Age Welding

Everyone agrees that the Space Age has assured in a new era of metals. But, wonderful as these metals may be, their value is only as good as their ability to be joined.

If you will turn to P. 99, you will find a special eight-page feature: How Welding Meets Challenge of Space-Age metals.

It describes the processes, techniques, equipment and controls that are making the use of these new metals possible. Welding editor R. R. Irving gets credit for the job.

Wanted: Trainees

On p. 65 of this issue, you'll find a thoughtful analysis of a serious problem — the lag in industrial training.

In some areas where chronic unemployment exists, jobs for trained workers are going begging. Philadelphia, for example, with a high number of jobless, still needs draftsmen, machine tool operators, welders, electronic assemblers and sheet metal machine operators.

Proud, But Sad—This isn't the only shocking part of the problem. In researching this week's story, associate editor Paul Cathey interviewed William E. Brunton, director of Vocational Education for the School District of Philadelphia.

Mr. Brunton proudly described his department's new instrumentation course. (See photo.) A total of $90,000 worth of instruments have been collected in one room for this course. The installation even includes a computer.

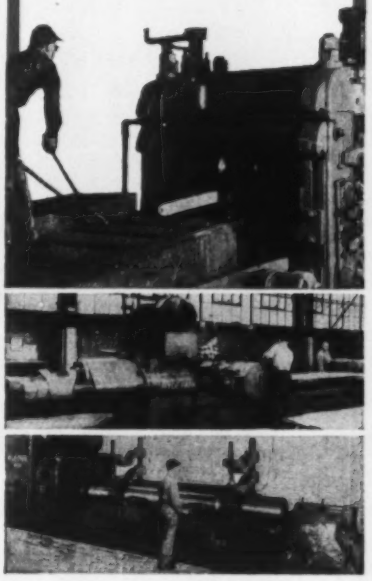
While pleased with the course and its potential, vocational school officials are unhappy about student response. This term, only fifteen students are taking the course.

One of the reasons, Mr. Brunton notes, is the current heavy emphasis on getting a white collar job. "Parents don't encourage youngsters to enter blue collar positions," he says.

Growing Problem—The problem of the youthful "untrained" will probably grow more acute. Some educators believe that by 1965 about 25,000 youngsters a week may be going into the labor market, many poorly trained and poorly educated.

WHERE ARE THE STUDENTS? In this room at the Murrell Dobbins Vocational-Technical School in Philadelphia is electrical-electronic equipment valued at $90,000. It's for a new instrumentation course which this term has only attracted a class of fifteen. (See column, above.)

Hyde Park
ROLLING MILL EQUIPMENT



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FIRST to guarantee—unconditionally—that its product would successfully survive the Automotive Industry's severe tests for brightness and corrosion-resistance . . . tests the product did pass, a performance that has caused thirteen competitors to try to copy Wallingford's unique method, a method that remains unmatched; and a performance that convinced one major automotive company to specify Wallingford Type 201 Bright Annealed exclusively!

FOREMOST in total Bright Annealed tonnage produced, in installed capacity for producing it, and in years of research, development, and application experience . . . eleven of them rewardingly spent in the refinement of this super functional and decorative material.

FINEST . . . our claim that Wallingford Bright Annealed is the finest is repeatedly reinforced by our customers' outspoken praise of it. Ask them. References willingly supplied on request.

And ask us how Wallingford Bright Annealed can enhance the beauty of your product, endow it with high corrosion resistance, and greatly reduce your finishing costs. Describe your application and we'll provide specific recommendations.

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COMING EXHIBITS

National Packaging Show — April 10-13, Lakefront Exposition Hall, Chicago. (American Management Assn., 1515 Broadway. Times Square, New York 36.)

Welding Show — April 17-21, New York Coliseum, New York. (The American Welding Society, 33 West 39th St., New York 18.)

Business Equipment Exposition— April 17-21, New York Coliseum, N. Y. (Office Equipment Mfg. Institute, 777 Fourteenth St., N. W., Washington, D. C.)

Powder Metallurgy Show — April 24-26, Hotel Sheraton - Cleveland, Cleveland. (Metal Powder Industries Federation, 60 E. 42nd St., New York 17.)

Castings Show—May 8-12, Brooks Hall, San Francisco, Calif. (American Foundrymen's Society, Golf & Wolf Rds., Des Plaines, Ill.)

Design Engineering Show — May 22-25, Cobo Hall, Detroit. (Clapp & Poliak, Inc., 341 Madison Ave., New York 17.)

MEETINGS

APRIL

National Assn. of Architectural Metal Manufacturers—23rd annual convention, Apr. 9-14, Plaza Hotel, New York, N. Y. Assn. headquarters, 228 North LaSalle St., Chicago 1, Ill.

The Metallurgical Society of AIME—National Openhearth Steel Conference, Apr. 10-12, Sheraton Hotel, Philadelphia. Society headquarters, 29 West 39th St., New York.

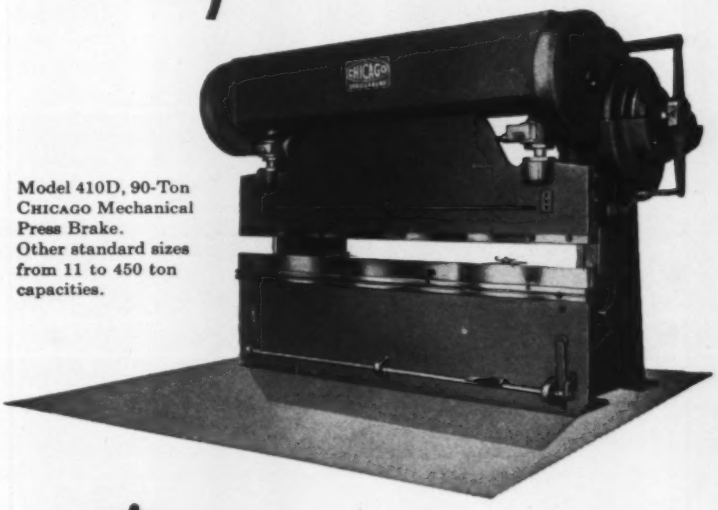
Ohio Valley Instrument - Automation-Electronic Exhibition and Symposium — April 11-12, Cincinnati Gardens.

American Institute of Electrical Engineers — Biennial conferences on electric heating, Apr. 11-12, Sheraton-Lincoln Hotel, Indianapolis, Ind. Institute headquarters, 33 W. 39th St., New York 18.

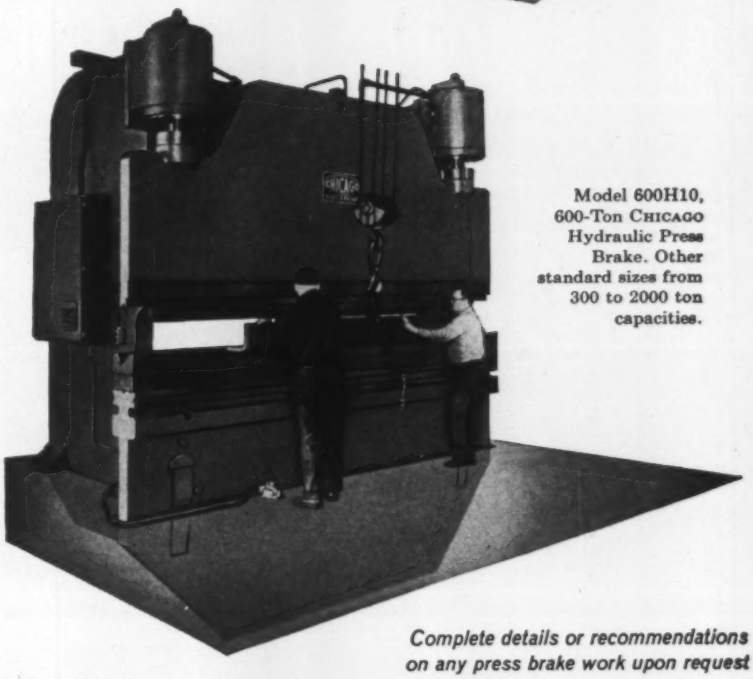
(Continued on P. 28)

CHICAGO® PRESS BRAKES

unexcelled accuracy / ***for sheet metal and plate work***



Model 410D, 90-Ton CHICAGO Mechanical Press Brake. Other standard sizes from 11 to 450 ton capacities.



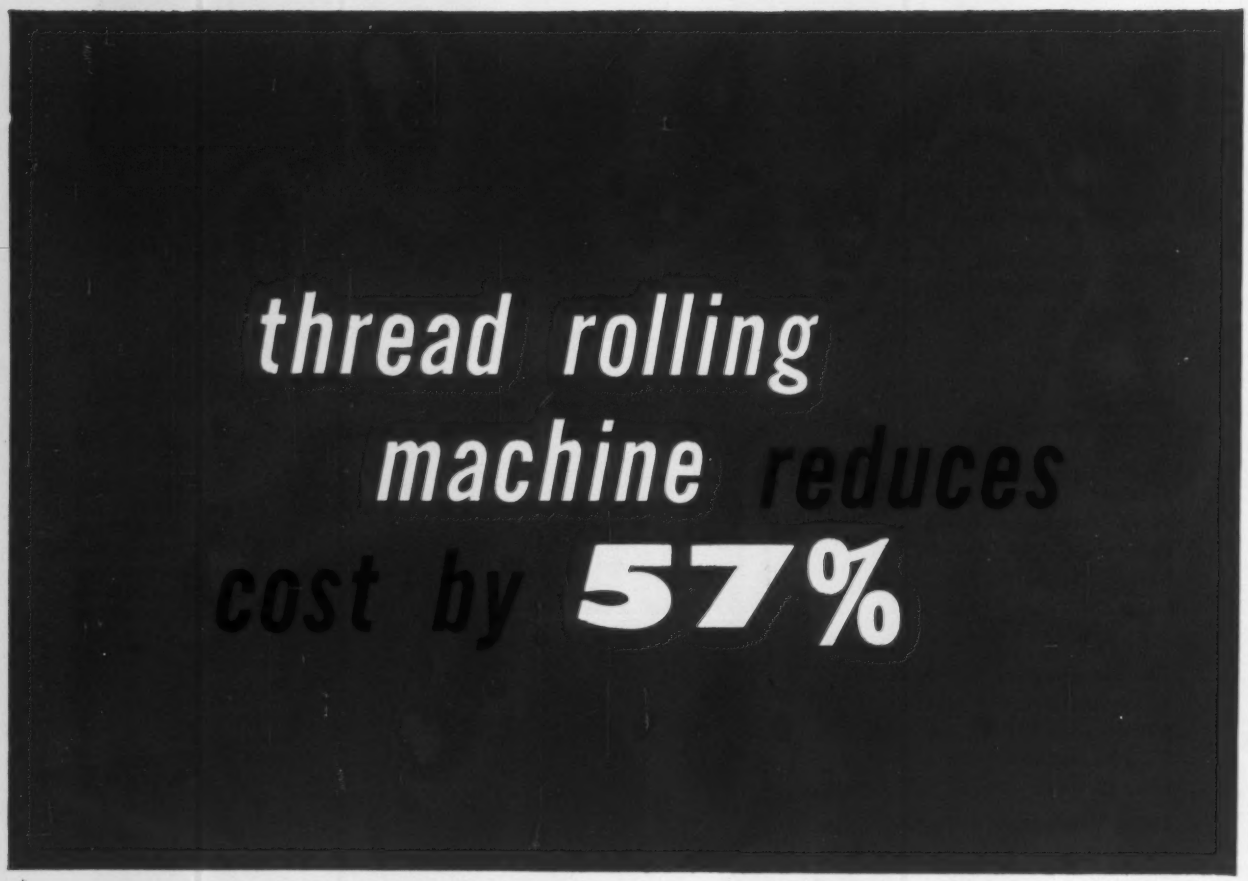
Model 600H10, 600-Ton CHICAGO Hydraulic Press Brake. Other standard sizes from 300 to 2000 ton capacities.

Complete details or recommendations on any press brake work upon request

Press Brakes
Press Brake Dies
Straight-Side-Type Presses
Hand and Power Bending Brakes
Special Forming Machines

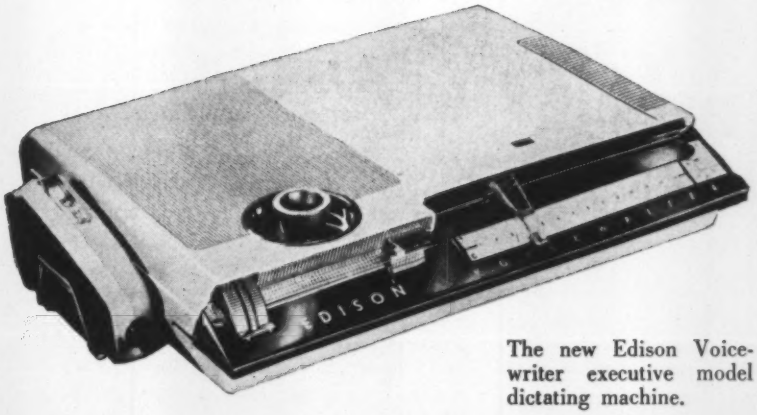
CHICAGO DREIS & KRUMP

DREIS & KRUMP MANUFACTURING CO.
7430 S. Loomis Blvd., Chicago 36, Illinois

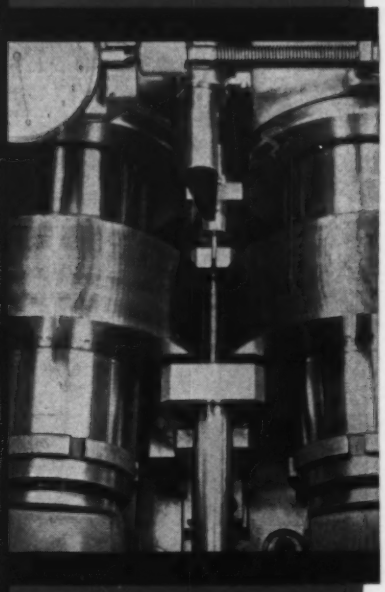


LANDIS *Machine* COMPANY WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT



The new Edison Voicewriter executive model dictating machine.



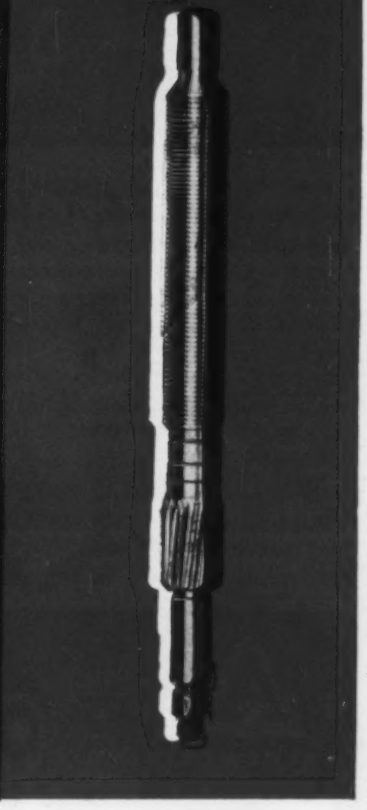
As a result of the versatility and high production of the LANHYROL Thread Rolling Machine, Thomas A. Edison Industries (McGraw-Edison Company), West Orange, New Jersey, is able to roll threads on a feed screw used in their Voicewriter dictating machine at a cost reduction of 57% as compared with having the job done by an outside vendor.

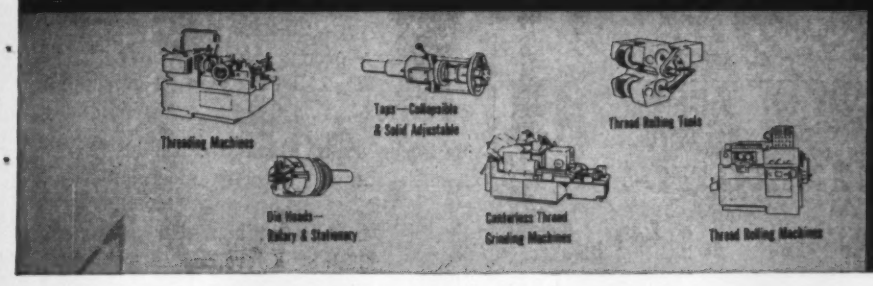
The cost-cutting benefits alone justify the purchase of the LANHYROL Thread Rolling Machine, but such things as an improved product, better able to meet exacting tolerance requirements, more efficient production control, and a reduction in materials handling and transportation cost are all advantages of rolling the part on the LANHYROL.

For instance, improving the product also meant a reduction in intangible costs such as a reduction in the readjustment of instruments due to variation in the previous manufacturing methods and the elimination of delays in production due to parts variations.

The LANHYROL Thread Rolling Machine produces strong, accurate threads of excellent finish by the chipless, cold-forming process using three different Rolling methods—Infeed, Thrufeed (as in this operation), and Continuous as required by conditions of workpiece design, material hardness or thread specifications. It will thread all diameters from 3/16″ to 3″, producing left-hand and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms. In addition to wide range coverage, the design provides a means for rapid size adjustment and versatility of application. Completely automated threading operations can also be obtained by hopper or magazine feeding.

Please send your specifications and let us show you how you can realize the cost saving benefits of the LANHYROL Thread Rolling Machine. Ask for Bulletin E-60.

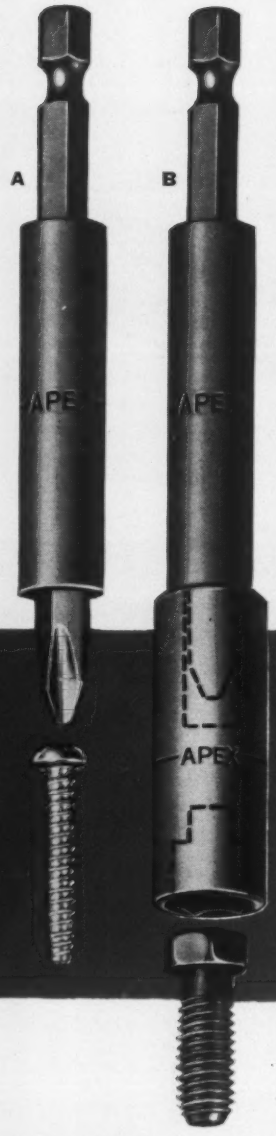




In assembly and fastening work, a tool operator may be driving screws one minute, running nuts the next.

To keep this work moving right along, you could use two power tools, or one power tool equipped with a slip chuck, to interchange bits and sockets.

But the best way to make one tool do two different jobs is to use an Apex socket that slips right on over the bit—in just seconds you're ready to run down nuts and bolts. The socket can be removed just as quickly when it's time to drive screws again. The Apex method makes for better, safer work, too, because there are fewer accessories on the tool and consequently far less wobble and looseness.



This APEX Socket converts a screwdriver into a nut runner ...in seconds!

Apex—the authority on fastening—offers the most complete line of standard and magnetic fastening tools, plus an array of specials that have solved some of the most unusual fastening problems. Write, on your company letterhead please, for

CATALOG 30-A
Nut Running Tools, ¼" to ⅝" hex, square drives.

CATALOG 30-B
Nut Running Tools, ¾" to 3½" hex, square drives.

CATALOG 30-C
Screwdriving Tools.

A. Apex M-490 Magnetic Bit Holder, with ¼" hex shank Apex Insert Bit to drive Phillips screws. Bit holder available in non-magnetic type.

B. Apex WJ-196-F Socket, to run 7/16" hex bolts, nuts. Solid hex shank on insert bit provides firm connection for ¼" female hex drive on socket. Socket available in magnetic type.

APEX FASTENING TOOLS
SCREWDRIVING • NUT RUNNING • SPECIAL

MEETINGS

(Continued from P. 25)

Steel Shipping Container Institute, Inc.—Annual meeting, Apr. 11-13, Kenilworth Hotel, Miami Beach, Fla. Institute headquarters, 600 Fifth Ave., New York.

American Society of Lubrication Engineers — Annual meeting and exhibit, Apr. 11-13, Bellevue-Stratford, Philadelphia. Society headquarters, 5 N. Wabash Ave., Chicago.

Copper & Brass Warehouse Assn., Inc.—Annual meeting, Apr. 11-14, Colorado Springs, Colo. Association headquarters, 1900 Arch St., Philadelphia.

Rail Steel Bar Assn. — Annual meeting, Apr. 17-18, Biltmore Hotel, New York. Association headquarters, 38 S. Dearborn St., Chicago.

American Welding Society—Annual meeting, Apr. 17-21, Commodore Hotel, New York. Society headquarters, 33 W. 39th St., New York 18, N. Y.

Scientific Apparatus Makers Assn.—Annual meeting, Apr. 23-27, The Greenbrier, White Sulphur Springs, W. Va. Assn. headquarters, 20 N. Wacker Dr., Chicago.

International Acetylene Assn.—63rd anniversary convention, Apr. 24-25, Sheraton-Plaza Hotel, Boston Assn. headquarters, 270 Park Ave., New York 17, N. Y.

Assn. of Iron & Steel Engineers—Spring conference, Apr. 24 - 26, Jefferson Hotel, St. Louis, Mo. Assn. headquarters, 1010 Empire Bldg., Pittsburgh, Pa.

Society of the Plastics Industry, Inc.—18th annual western section conference, Apr. 26-28, Hotel del Coronado, Coronado, Calif. Society headquarters, 250 Park Ave., New York 17, N. Y.

National Screw Machine Products Assn — Annual industry meeting, Apr. 30-May 3, Somerset Hotel, Boston, Mass. Assn. headquarters, 2860 E. 130th St., Cleveland, O.

Action When Our Customers Need it Most!

Shipped on an interim basis, this high frequency induction furnace got an Inductotherm customer back into business less than 24 hours after an unfortunate pouring accident temporarily put his old unit out of commission. Such service is part of Inducto's concept of doing business . . . an obligation we feel to keep every customer's furnaces pouring on schedule regardless of emergencies. Should trouble develop, Inductotherm usually has a trained engineer on the spot in a matter of hours. Emergency orders are stamped for special priority . . . replacement parts shipped immediately from Inducto's complete inventory—all to assure that your work will be started at once and continued into overtime if necessary.

But service is only one of the overall cost-saving benefits Inductotherm offers. For a look at the entire story, ask to have an Inducto engineer call. Inductotherm Corporation, 412 Illinois Ave., Delanco, N. J.

INDUCTOTHERM

OHIO *Round Tubing*
To 7-1/2" OD x .375" wall

See us at the
DESIGN ENGINEERING SHOW
Cobo Hall, Detroit—May 22-25

A-3673A

OHIO *Square Tubing*
To 6" x 6" x .259" wall

OHIO *Rectangular Tubing*
To 7-1/2" major diameter x .259" wall
Typical 4" x 6" x .259" wall section illustrated

Announcing Mechanical — Pressure — Cold Drawn

OHIO QUALITY WELDED STEEL TUBING

in larger sizes...heavier wall thicknesses

New sizes and heavier wall thicknesses of Ohio Quality Welded Steel Tubing (up to 7½" OD) now parallel the sizes of famous Ohio Seamless Steel Tubing. That means — now more than ever — there's a type and size of Ohio tube to fit your special requirements exactly. And since we make both types, we're in a position to recommend the best type for your own particular needs. Ohio Tubing — either welded or seamless — is just "made to order" for your product.

OHIO SEAMLESS TUBE

Division of Copperweld Steel Company • **SHELBY, OHIO**

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

Cut along line and send air mail to save time.

RUSH me, without obligation, latest information on new larger sizes and heavier wall thicknesses of Ohio Welded Steel Tubing.

Name_____ Title_____

Company _____

Address_____ City_____ State_____

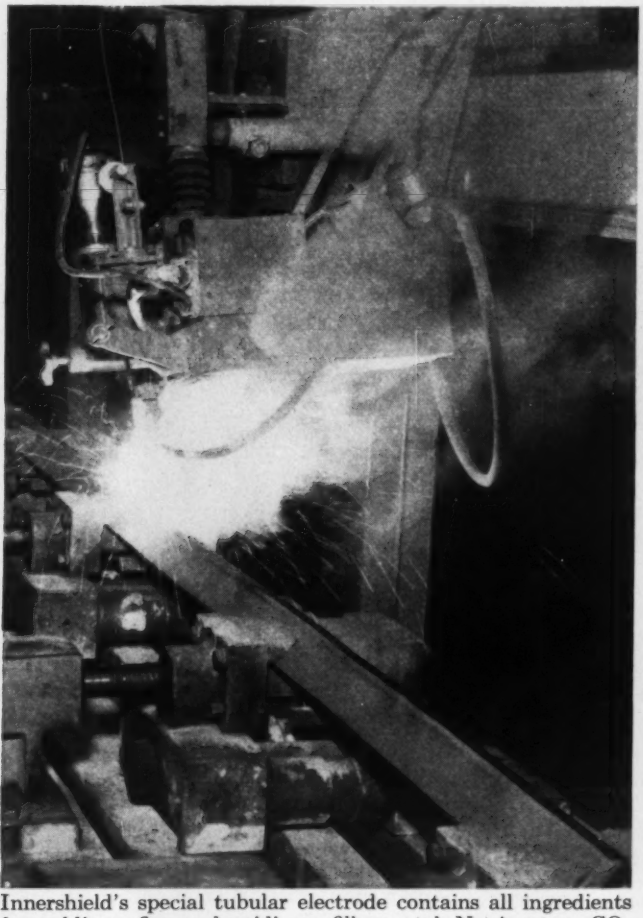
Leading automaker saves because...

INNERSHIELD ELIMINATES

Two Innershield heads moving horizontally with two moving elliptically weld brackets to rear axle in 4½ seconds. No separate flux or gas systems needed.

COSTLY FLUX HANDLING

Lincoln's new Innershield process is clean. No need for expensive flux handling and recovery systems. No abrasive dust to wear out costly, complex fixtures. Atmosphere stays cleaner, simplifies housekeeping, improves working conditions. No slag removal problems.



Innershield's special tubular electrode contains all ingredients for welding—fluxes, deoxidizers, filler metal. No Argon or CO_2 needed. Here, Innershield welds angle iron for farm machinery part at 80 ipm compared to 40 ipm with CO_2. Tanks, hoppers, structural beams all are now welded with this process, too.

Semi-automatic Innershield Squirt lets an amateur turn pro in minutes. Electrodes bridge gaps caused by poor fitup. Slag flicks off with a swipe of the electrode tip. Have a Lincoln field engineer show you how Innershield Squirt can increase the operating factor and deposition rates on your jobs.

New brochure describing Innershield process and full and semi-automatic equipment is just off the press. Get your copy now. Write The Lincoln Electric Company, Dept. 1921, Cleveland 17, Ohio.

LINCOLN WELDERS

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT AND ELECTRODES

New Safety-Lock Tab • Improved Cup Shape Add Increased Protection and Comfort to AO Flexible Mask Goggles

Here are four improvements that make these new AO Vinylite Mask Goggles safer to use, more comfortable to wear:

1 New lock tab, with snap button, holds lens securely to frame at point of greatest stress, improves fit around entire frame. Lens will not pop out, but can be removed quickly and easily for cleaning or replacement.

2 New recessed slots at end of cup fit *over and around* temples of safety (or regular) glasses to keep entire cup edges in contact with face.

3 Increased eye cup depth gives additional coverage and protection at temples.

4 Improved flash around entire edge of mask molds to contours of face.

Lightweight, well-ventilated, extra-large face mask and .050" thick acetate lens assure the wearer of comfortable, optically correct, wide-angle vision while protecting entire eye area.

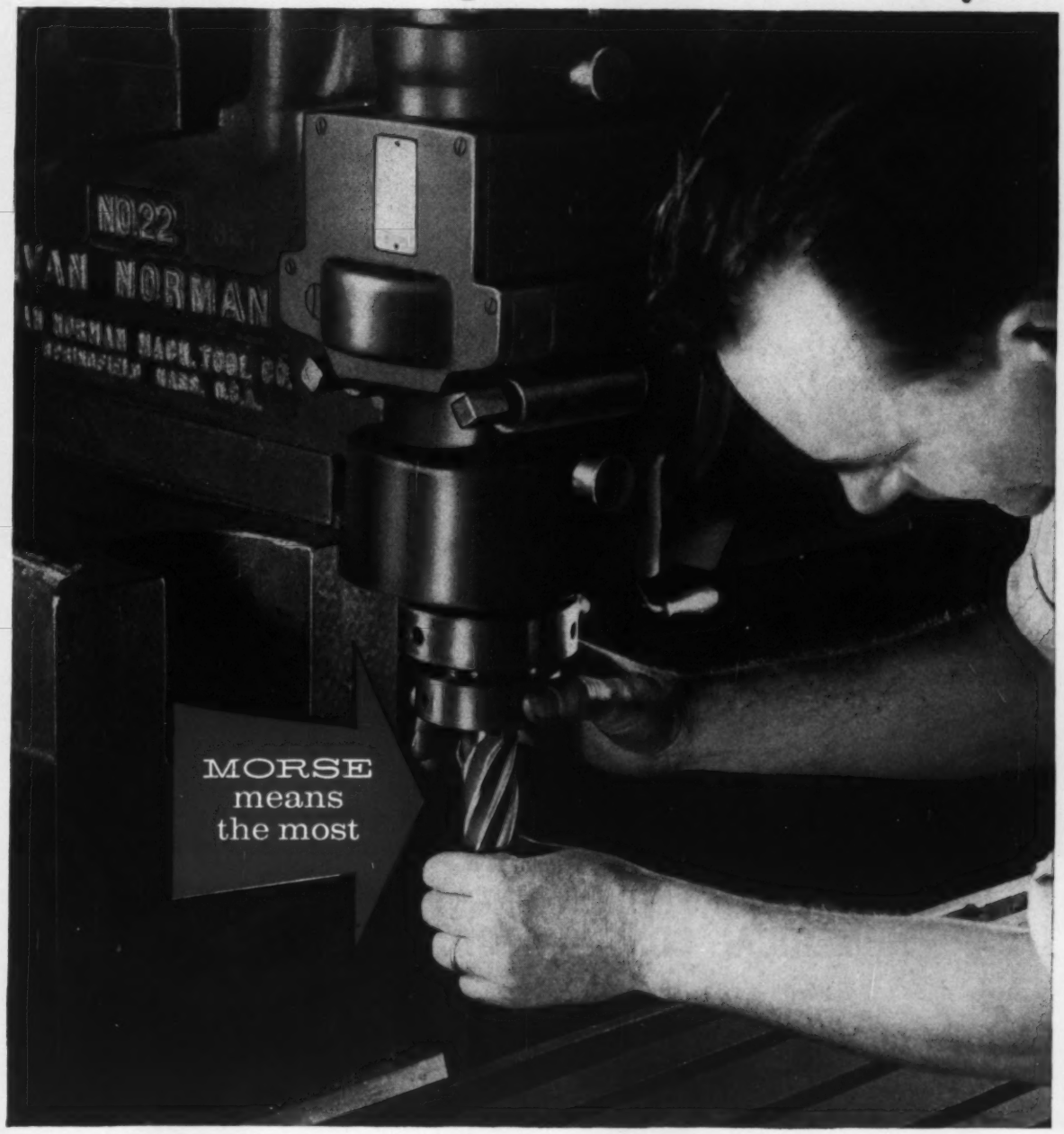
Your nearest AO Safety Products Representative now has this improved new model in impact goggles, chemical goggles, welding goggles, or chipping and grinding goggles, as well as two special models for maximum protection against chemical splash. Contact him today, or write for detailed folder, S-1229.

Your Surest Protection . . . AO SURE-GUARD GOGGLES

American Optical
COMPANY

SAFETY PRODUCTS DIVISION • SOUTHBRIDGE, MASSACHUSETTS

with men who know cutting tools... it's MORSE everytime



TRY **MORSE**... BUY **MORSE**
SEE YOUR NEARBY **MORSE** DISTRIBUTOR

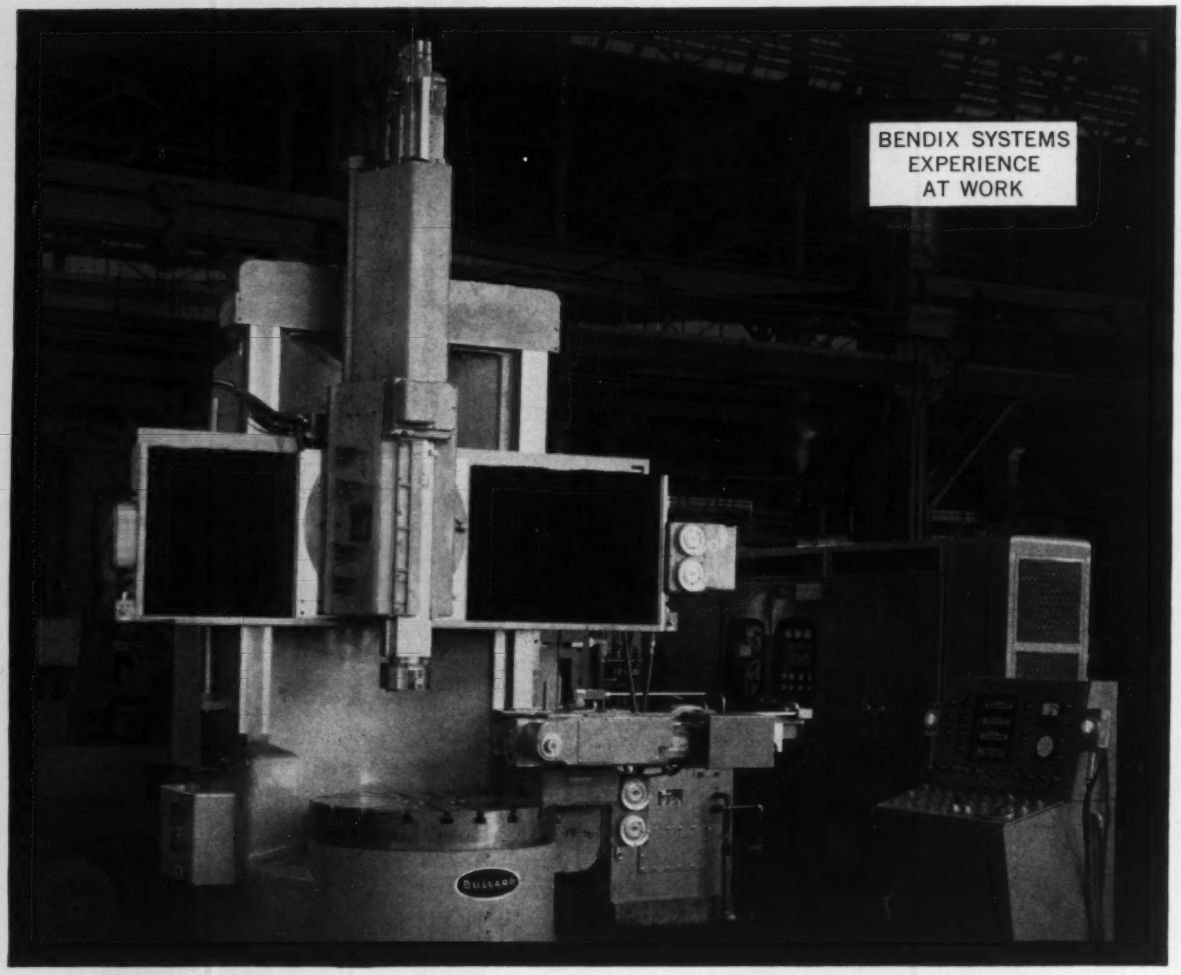
MORSE

MORSE TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASSACHUSETTS

A Division of VAN NORMAN INDUSTRIES, INC.

2694

WAREHOUSES IN: NEW YORK • CHICAGO • DETROIT • DALLAS • SAN FRANCISCO



BENDIX SYSTEM ENGINEERING PROVIDES OPTIMUM NUMERICAL CONTROL FOR TURRET LATHE

Shown above is a Bullard four-axis vertical turret lathe equipped with Bendix DynaPath-14 contouring control unit. In this application, the selection of tools and spindle speeds is programmed, as is the motion of both slides.

Bendix application engineers, with accumulated experience in mechanical and hydraulic analysis of machine tools, worked closely with Bullard to produce this wedding of machine tool and numerical controls. And Bendix systems experience gained in working on other contour turning applications (with such companies as Ex-Cell-O, Heald, and Giddings & Lewis) assures the user correct application of control unit to machine tool.

In addition to contour turning applications, Bendix engineers numerical control systems for milling, grinding, drilling and jig boring machines. We have developed and applied controls to 2-, 3-, 4-, and 5-axis systems, both continuous path and point-to-point. These controls are being used daily in plants across the country to increase machine tool efficiency, reduce lead times, and make parts of consistently high accuracy.

Bendix SYSTEMS EXPERIENCE can provide the key to your machine tool problems. The right Bendix numerical control unit can be the profit-maker you've been looking for. Start putting Bendix application engineering experience to work for *you*—write today for a copy of our catalog number 308.

BENDIX PROVIDES SYSTEMS EXPERIENCE

JUSTIFICATION STUDIES • SYSTEM ENGINEERING • TRAINING AND SERVICE

Industrial Controls Section

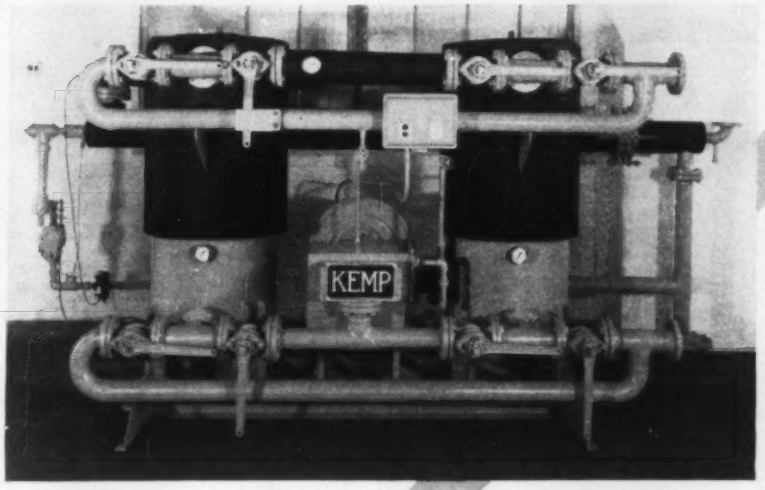
21820 Wyoming Ave., Detroit 37, Michigan

THE Bendix CORPORATION

For precise control of metal-working atmospheres (drying Nitrogen, Hydrogen and annealing gases to –60° F. dewpoints)

...KEMP CONVECTION DRYERS

cut down-time, up production-time 4 ways!



1 Full Reactivation . . . assures unmatched drying power for air, gases or liquids. Exclusive external design allows complete reactivation unaffected by variations in flow rate or dry gas needs.

2 Low Pressure Loss . . . is another Kemp Convection Dryer cost-saving feature. Unique full-flow design of drying towers and connections assures the least pressure loss, lower operating cost.

3 Automatic Control . . . is achieved once you pre-set the program timer. The reactivation cycle of heating and cooling then becomes automatic. All Kemp Dryers are easily switched to manual control, too.

4 Safety-proved Operation . . . is a fact with any Kemp Dryer. Check and relief valves, an alarm circuit . . . all protect the entire system. Write for Bulletin D-106 for further details . . . or contact your local Kemp Representative.

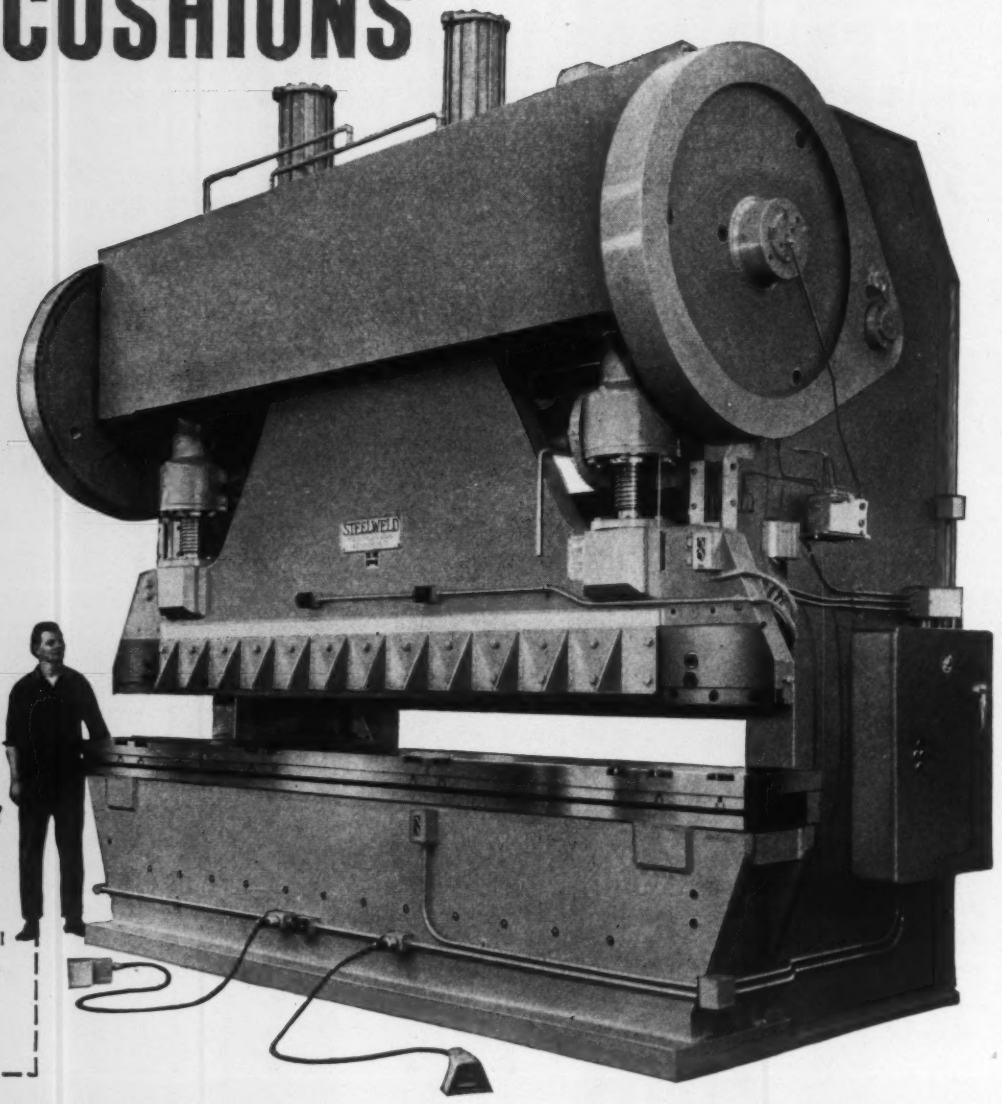
It always pays to come to

KEMP OF BALTIMORE

THE C. M. KEMP MANUFACTURING COMPANY
405 E. Oliver St., Baltimore 2, Md.

PRESS BRAKES with DIE CUSHIONS

This die-cushion-equipped mechanical Steelweld press brake has two speeds, 7 and 20 strokes per minute. Stroke length is 6 inches. Shut height is 20 inches.



Steelweld *Mechanical and Hydraulic* **Press Brakes** are available in all sizes to 2000 tons capacity for plate lengths to 30 feet.

Steelweld Press Brakes — mechanical or hydraulic — can be furnished with die cushions built in.

The brake illustrated was provided with twelve pneumatic die cushions assembled in a single line between the two bed plates. Each has a rating of four tons, or 48 tons total, when operated at 100 lbs. air pressure. Maximum capacity is 60 tons at 125 lbs. air pressure. Stroke of the cushions is adjustable from 0 to 3 inches.

The machine is rated 400 tons and will bend 12' x ½" mild steel between housings. Total length of bed and ram is 16'-0" including 10-inch extensions at both ends. The double plate bed is 20" wide. The ram has detachable brackets on either side. Throat depth is 18". Air-operated ram counterbalances are provided.

Control is air-electric with two foot stations for operation by one or two men. It includes "inch" and "run" with automatic stop at top of stroke. Ram adjustment is motorized. Back gauge has a range of 48 inches and rides on ball bearings. It is motor driven and front operated.

The design of Steelweld brakes simplifies the incorporation of die cushions and various features found helpful for metal forming operations. Therefore, it is possible to include at reasonable cost special features that will speed or aid unusual forming work.

Write for free booklet No. 2023

STEELWELD
Mechanical and Hydraulic
PRESS BRAKES

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

STEELWELD MACHINERY DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 4880 E. 281ST STREET • WICKLIFFE, OHIO

Hot stuff served up on rubber

Improved B.F.Goodrich belt saves customer $5500 in 13 months

THE cargo on that belt was causing plenty of trouble in this zinc plant. It's a highly abrasive sinter mix—still so hot at this point that it used to burn out belts after only 4 months' service.

When a B.F.Goodrich distributor heard about the trouble, he recommended a new kind of conveyor belt, called Solarflex, designed specifically for handling hot materials. This B.F.Goodrich belt is made of special rubber that stays soft and pliable at hot temperatures that cause other belts to harden, crack and finally break down.

At last report, the B.F.Goodrich Solarflex belt had been on the job 13 months. Belt service had tripled. And the customer had saved over $5500 in belt replacements and installation costs.

When you call on a B.F.Goodrich distributor for help with a conveying problem, you can count on getting the kind of belting that will keep things in your plant moving, cut down on repairs, and give you more for your money in terms of long, useful service

BFG distributors have full information on this hot-material belt. And, as factory-trained specialists in rubber products, they can answer questions about the many products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Department M-978, Akron 18, Ohio.*

B.F.Goodrich

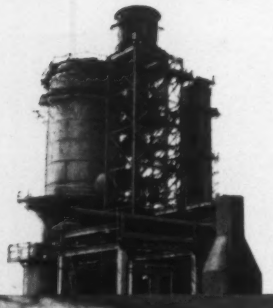
CONVEYOR BELTS

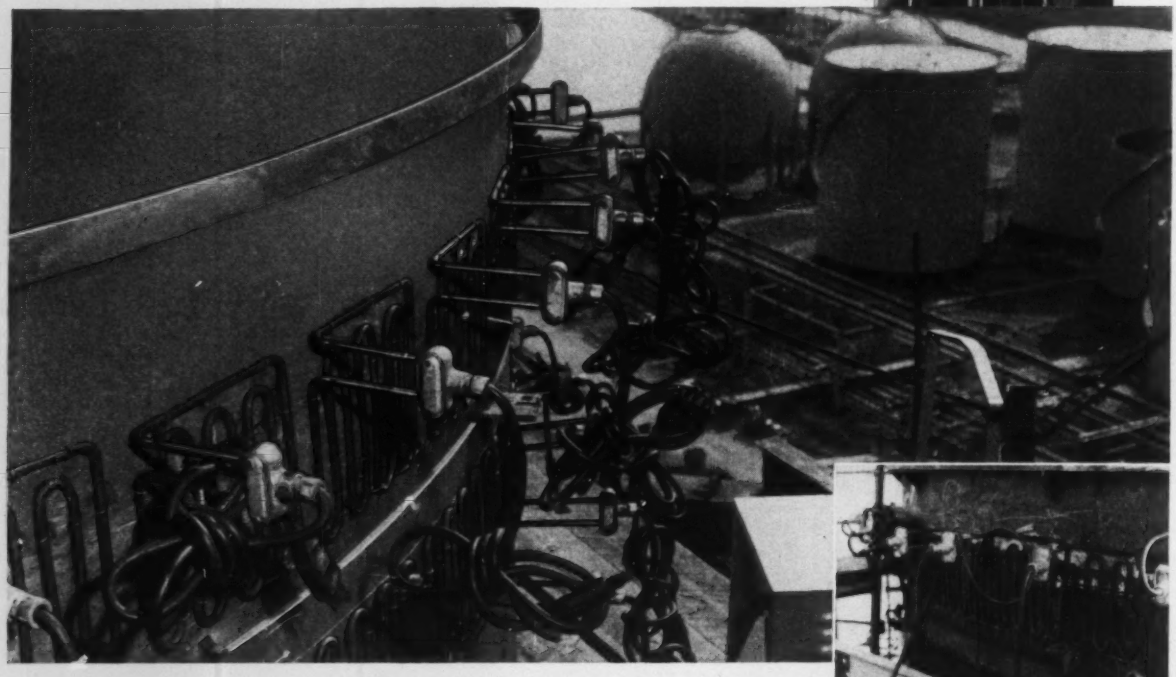
Weld a "cat" cracker 12 stories up . . . a nuclear power reactor . . . the hull of a missile-firing sub . . . or any hard-to-weld structure, of any size or shape, anywhere . . . with **economical, safe, versatile NOTTINGHAM Heatrol** systems for

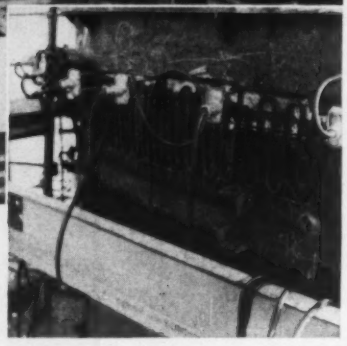
Controlled, Concurrent

HEAT TREATING

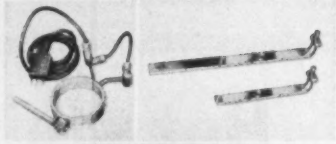
Preheat • Postheat • Stress-relief annealing



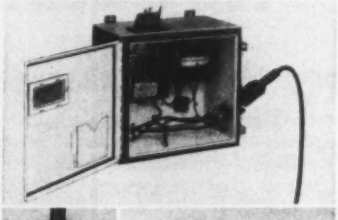


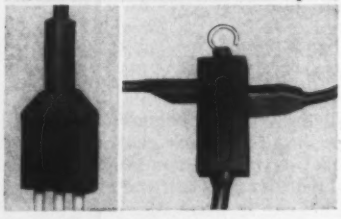


CRITICAL PRESSURE-VESSEL WELDING, with one quickly installed system for preheat and stress-relief annealing, at temperatures up to 1,350° F, typifies the versatility of this new way to heat-treat with plug-in equipment. Electrical-resistance heater units (above and right) rapidly, uniformly heat any weldment, including piping — automatic controls (below) closely hold pre-set temperatures — molded Neoprene-insulated distribution systems grow with the job, provide COMPLETE SAFETY PROTECTION.



FULL-LENGTH HEATER ELEMENTS eliminate "cold spots," make intimate contact with weldments of various sizes and shapes, including pipe down to 3" diam (upper). **Pre-set any program** with automatic temperature-time controls (middle). **Plug-in power distribution equipment,** fully protected against electrical and physical hazards (lower).





PUTS YOU IN CONTROL OF WELD QUALITY. Automatically, continuously controlled heat-treating, concurrent with welding, permits strong, ductile welds on high-performance alloy steels. Waterproof reverse-taper connections assure dependable operation under all conditions.

SAVES TIME, CUTS COSTS . . . using, owning, maintaining. Even unskilled help can quickly connect and disconnect plug-in units, without cutting, splicing, taping, without tools . . . polarized plugs and receptacles prevent wrong connections. Use these rugged, interchangeable units on job after job.

COMPLETELY SAFE. Personnel and equipment are fully protected by built-in breakers and fuses, equipment-grounded circuits, molded Neoprene-insulated construction that prevents accidental contact. For complete technical information, ask

NOTTINGHAM *Heatrol*

Safety-engineered Building-Blok systems for controlled heat treating

J. B. NOTTINGHAM & Co., Inc. 441 LEXINGTON AVE., NEW YORK 17, N. Y.

The Prime Mover Company, manufacturer of materials handling equipment, says:

Our "Prime Movers" give these 6 parts a terrific beating...that's why they're made of LaSalle

Engineers of the Prime Mover Company, Muscatine, Iowa, demanded the most dependable steel bars available for six important parts of their transmission assembly. Here are some of the reasons they specified STRESSPROOF!

You don't have to heat treat STRESSPROOF! There's no heat treat distortion.

STRESSPROOF is strong . . . 100,000 psi.

It machines faster . . . at 83% the speed of B1112.

It wears better without case hardening . . . replacing .40 carbon alloy steels and other heat treated and alloy steels, such as 8640, 4140, C1045, C1141, and C1137.

It costs less than heat treated in-the-bar alloys.

STRESSPROOF®
STEEL BARS
with copper

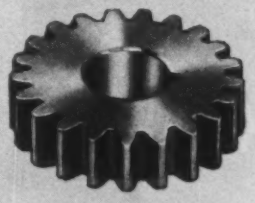
Strength Without Heat Treating

Worm Shaft, 1½"

Input Shaft, 1 3/32"

Driving Axle, 1 3/32"

Shifting Shaft, ¾"



Reverse Pinion, 3"

Bearing Carrier
Clutch Throwout, 2¼"

Use this coupon to request technical bulletin announcing improvements in LaSalle STRESSPROOF Steel Bars...with copper.

La Salle STEEL CO.

1436 150th Street
Hammond, Indiana

Please send technical bulletin "Today's Improved LaSalle STRESSPROOF Steel Bars...with Copper."

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

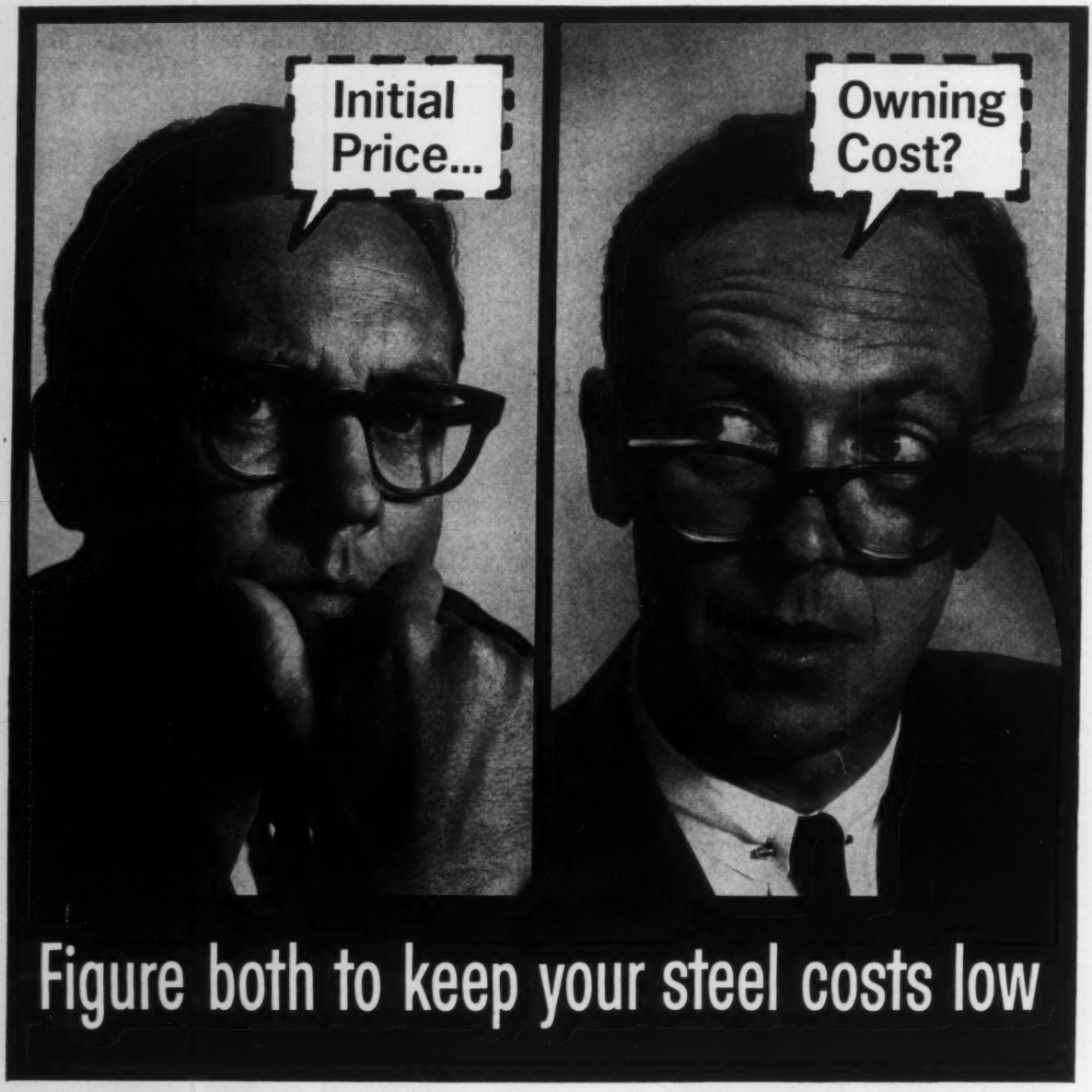


Figure both to keep your steel costs low

You can keep your steel costs low only when you look beyond steel's low initial price. Recognize how much unnecessary—and often hidden—costs of possession can add to your *final* costs. By using the facilities of your steel service center you frequently can minimize or eliminate the extra expenses of storing, handling and readying steel for use.

Each steel user's case is different. Your steel service center will be glad to help you determine the most economical way to buy steel. Figure all your costs of possession, such as:

Cost of capital:	Cost of operation:	Other costs:
Inventory	Space	Obsolescence
Space	Material handling	Insurance
Equipment	Cutting & burning	Taxes
	Scrap & wastage	Accounting

Call your nearby steel service center, or write for free booklet, "What's Your Real Cost of Possession for Steel?"

STEEL SERVICE CENTER INSTITUTE

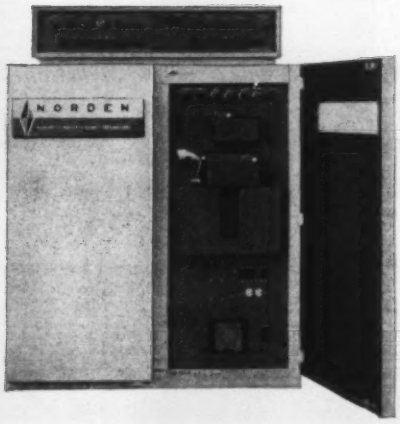
...YOUR STEEL SERVICE CENTER

Steel

STEEL SERVICE CENTER INSTITUTE
540-D Terminal Tower, Cleveland 13, Ohio

NORDEN

Modumatic control systems for automatic positioning



The Norden Series 600 is a numerical control system for automatic point-to-point linear or rotary positioning.

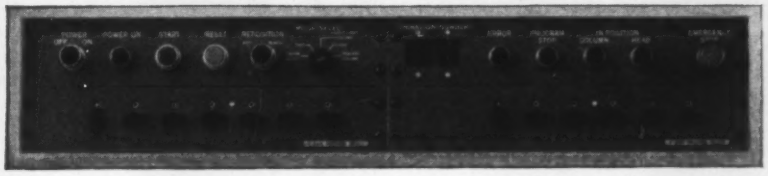
This system features a new concept in numerical control with modumatic design permitting the exact degree of automation required.

This new concept is achieved by an exclusive design utilizing an absolute digital feedback transducer, electronic circuitry, and visual display. It offers complete automatic positioning with input from either manual dial-in or punched tape. Display units provide continuous decimal readout of *actual* position—not command.

NORDEN 600 SERIES FEATURES:

Full Range Electronic Origin Select—allows desired offset to be quickly and easily dialed in by the operator on manual selector switches.

Actual Position Readout—the actual position is displayed in straight decimal form by illuminated numbers that are readable from twenty feet.



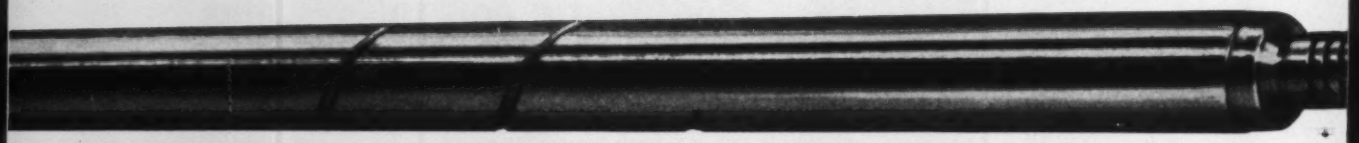
Full Range Electronic Positioning Select—allows positioning to be controlled manually or by tape. Tape program can be interrupted to insert additional or intermediate operations.

Controlled Programming—with automatic tape punch equipment, tapes may be prepared "on the machine" providing a permanent inspection record or a programmed tape for playback applications.

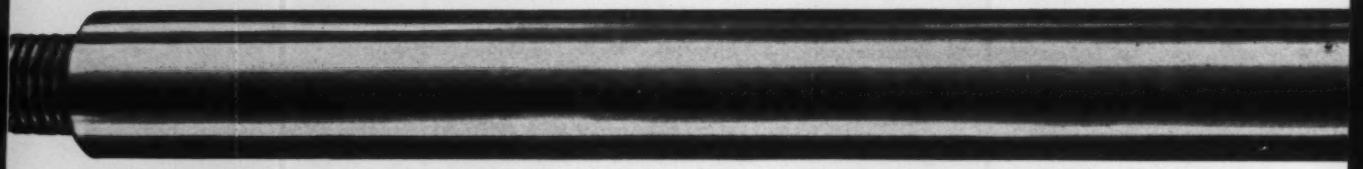
For complete details on the Series 600, or other modumatic control systems, contact your nearest Norden Representative—400 Main Street, East Hartford, Connecticut, JAckson 8-8411—11 West Ave., Dayton 2, Ohio, BAldwin 8-4481, or write to us at the address below.

NORDEN

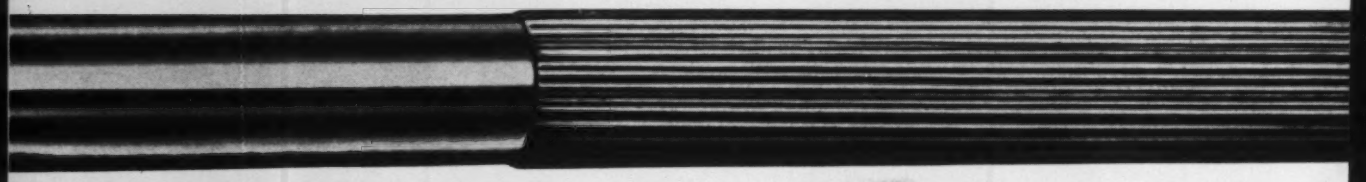
DIVISION OF UNITED AIRCRAFT CORPORATION
DATA SYSTEMS DEPARTMENT
3501 HARBOR BOULEVARD, COSTA MESA, CALIFORNIA



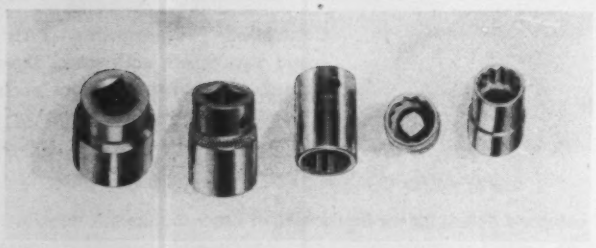
CENTURY SERIES C-1144 for highly machined parts.



CENTURY SERIES C-1141 and C-1151 for moderately machined parts.



CENTURY SERIES C-1050 and C-1045 for parts where machinability is a minor factor.

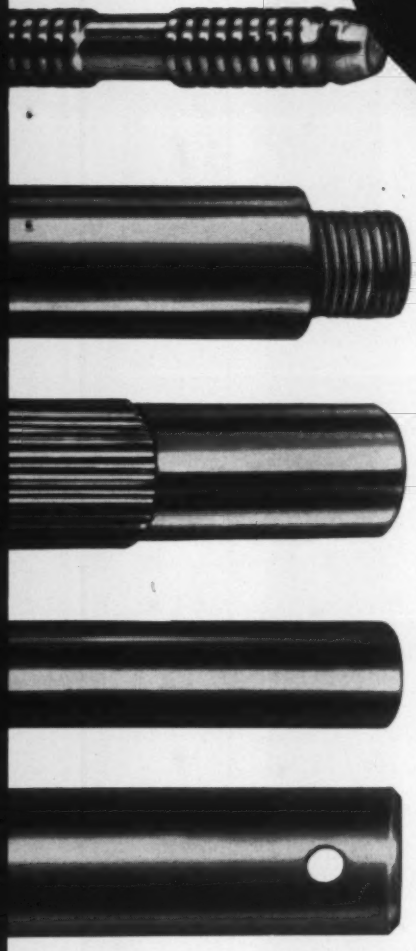


WRENCH SOCKETS, made by Herbrand Division of The Bingham-Herbrand Corporation, Fremont, Ohio, illustrate the kind of application where the superior strength, toughness, and machinability of *Republic Cold Finished Alloy Bars* help produce a better product at lower cost.

Bars are formed, drilled, and cut off in an automatic screw machine, then hot broached to shape internal dimensions. Final stages of socket production include heat treat and chrome plating. Mail coupon for more data on Republic Alloy Bars.

ROTOR BUCKETS for Mechanical Drive Turbines manufactured by Elliot Co., Jeanette, Pa., are produced from *Republic Stainless Steel Special Sections* . . . an excellent example of how Republic Special Sections save money on tough-to-make parts.

User benefits include: simplified machining, corrosion and abrasion resistance, greater strength and hardness, smooth surfaces that reduce or eliminate finishing operations. Available in a wide range of sizes and contours . . . carbon, alloy, stainless steel, and titanium. Send coupon.



Cut Material Costs on High Strength Parts

Republic CENTURY 100 SERIES Cold Finished Bars

LET YOU CHOOSE FROM 5 GRADES, 5 DEGREES OF MACHINABILITY, 5 PRICE LEVELS

With Republic's CENTURY SERIES of high strength, stress-relieved, cold finished steel bars, you pay only for the machinability you need to meet your production requirements. CENTURY SERIES bars are priced on a descending scale (as machinability decreases, price drops). This makes it possible for you to realize important savings by selecting lower-sulphur-content, high-strength-toughness-ratio bars for applications where machinability is not of prime importance. Each of the five grades has a minimum yield strength of 100,000 psi.

PRODUCTION FACILITIES for CENTURY SERIES bars are strategically located in key metalworking markets to serve you better. Result: faster deliveries, and expert metallurgical service, *when you need it,* on the complete line of Republic Cold Finished Steel Bars. For more information on CENTURY SERIES bars and Republic Metallurgical Services, send the attached coupon.

This STEELMARK of the American Steel Industry tells you a product is made of Steel. Look for it when you buy. Place it on the products you sell.

Steel

REPUBLIC STEEL

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. IA-1565
1441 REPUBLIC BUILDING · CLEVELAND 1, OHIO

Send more information on:

- ☐ CENTURY SERIES
- ☐ American Steel Industry STEELMARKS
- ☐ Cold Drawn Special Sections
- ☐ Cold Finished Alloy Steel

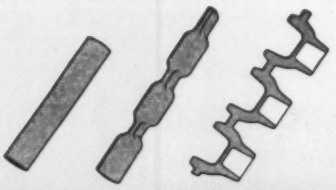
Name_____ Title_____

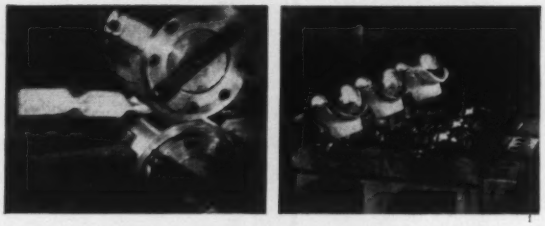
Company_____

Address_____

City_____ Zone____ State_____

REDUCEROLL + MAXIPRES = Modern Forging!



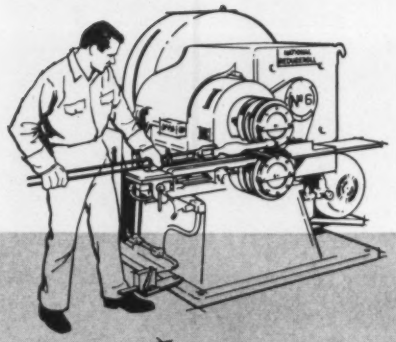


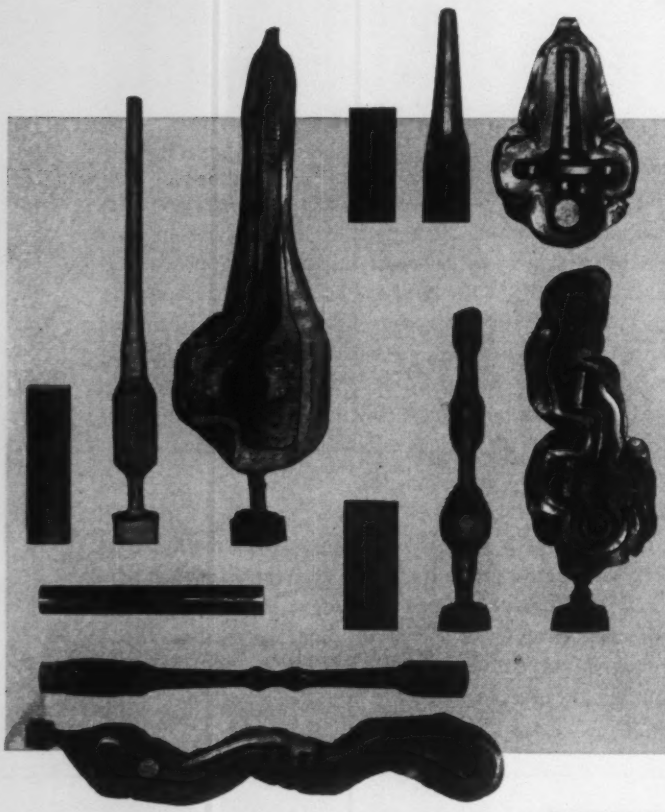
Modern forge plants around the world are using the method shown at right:

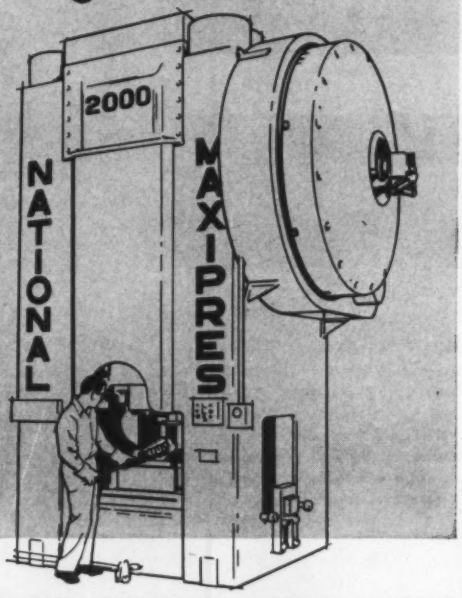
1. Prepare forging blanks in Reducerolls;
2. Finish forge in Maxipresses on the same heat.

Cost of making these forgings, and others, reduces by *one third* (even more!) thanks to modern engineering, latest-design equipment and proven methods.

Bring your prints or forgings to Tiffin. Let's discuss your plans for automatic or manual forging, but without obligation.







Founded 1874—DESIGNERS and BUILDERS of MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS CO-PIONEERS WITH INDUSTRY OF ADVANCED METALWORKING PRODUCTION METHODS

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U. S. A.

HARTFORD **DETROIT** **CHICAGO**

BLASTING HAMMER STANDARDS WIDE OPEN... ONLY BLACK & DECKER DARES OFFER YOU

FREE YEAR'S SERVICE ALL PARTS AND LABOR*

Tough, practically maintenance-free . . . that's what you've heard about B&D Hammers. Now Black & Decker gives you *proof* of its confidence in these rugged tools with a free service and parts certificate good for one full year.

Of course, the reasons for buying B&D Hammers don't begin and end with this special service certificate. Look around and you'll see Black & Decker Hammers cost less to buy and maintain than others with the same capacities. Versatility and power are in B&D's favor, too. Any one of Black & Decker's four hammers with any one of their many accessories can do any number of maintenance, construction or production jobs. And you'll find their exclusive spring-and-compressed-air power transmission packs such a wallop per blow that work goes far faster, finishes much better.

Ask about the free service certificate with B&D Hammers. B&D tools are sold at leading distributors everywhere. *For sales or service, look in the Yellow Pages of your telephone book under* TOOLS ELECTRIC

***You don't pay a penny for normal maintenance during a whole year of operation, under the terms of the service certificate.**

B&D versatility and power give you more wallop, more work!
Choose from 4 hammer models and many accessories for setting shields, drilling, chiseling, channeling, chipping, roughing, pointing, cleaning, slotting and hundreds of other jobs.

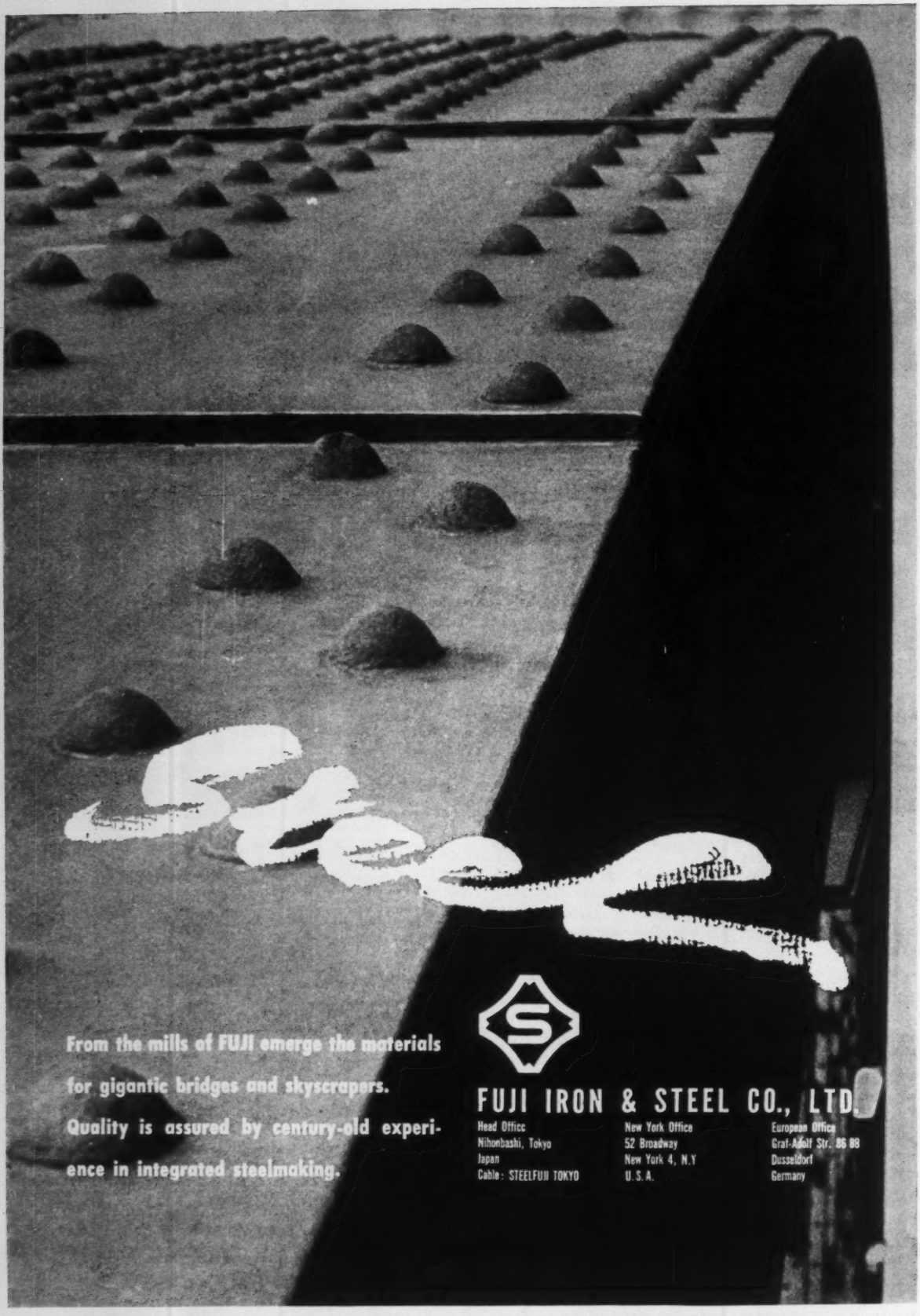
Black & Decker®
CUTS MAN-HOURS TO MINUTES

THE BLACK & DECKER MFG. CO., Dept. 0904
Towson 4, Md.

☐ Please arrange for a demonstration of.....
☐ Please send me 20-page hammer handbook.

Name.....Title.....
Company.....
Address.....
City.....Zone....State.....

☐ Vacuum Cleaners ☐ Drills ☐ Belt Sanders ☐ Magnetic Drill Presses


From the mills of FUJI emerge the materials for gigantic bridges and skyscrapers. Quality is assured by century-old experience in integrated steelmaking.
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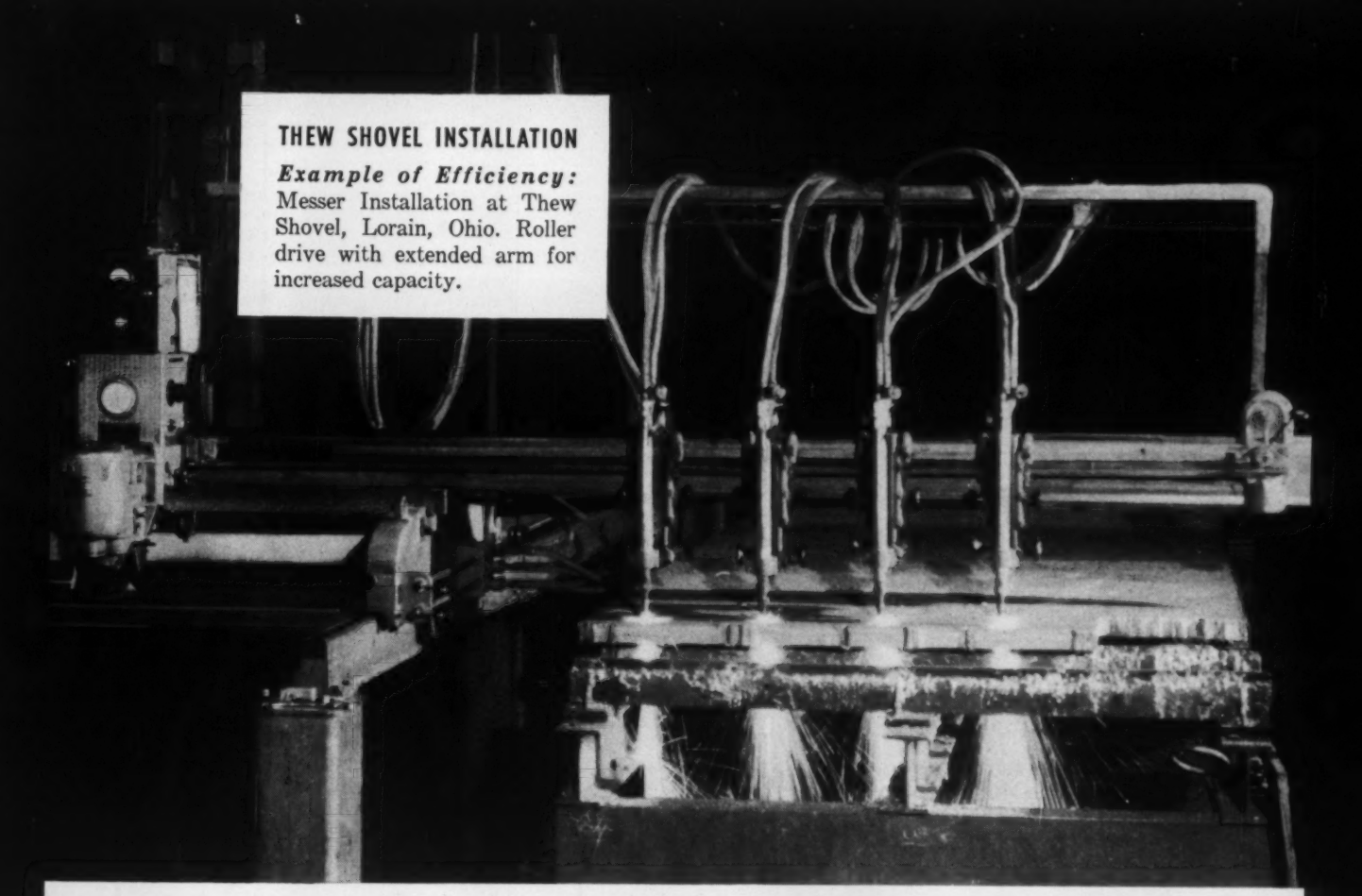
Graf-Adolf Str. 86 88
Dusseldorf
Germany



THEW SHOVEL INSTALLATION

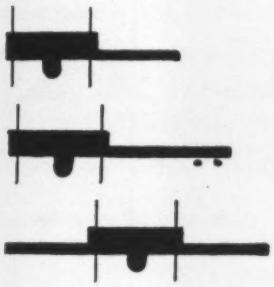
Example of Efficiency: Messer Installation at Thew Shovel, Lorain, Ohio. Roller drive with extended arm for increased capacity.

Whatever YOUR Needs... Only

MESSER

Offers You a COMPLETE Line of Flame-cutting Machines

STATOSEC—Sizes: 48″, 60″, 80″, 100″, 120″. Available in either conventional or roller drive with choice of these designs.



STANDARD
(cutting capacity equal to width)

EXTENDED ARM
(cutting capacity 20″ or 40″ greater than width)

DUAL ARM
(cutting capacity double the width)

SICOSEC—Moderately priced, fully electronic drive. Sizes up to 144″. Available in standard, extended, or dual arm.

SICOMAT—The incomparable sine-cosine drive machine for shipbuilding and heavy industry.

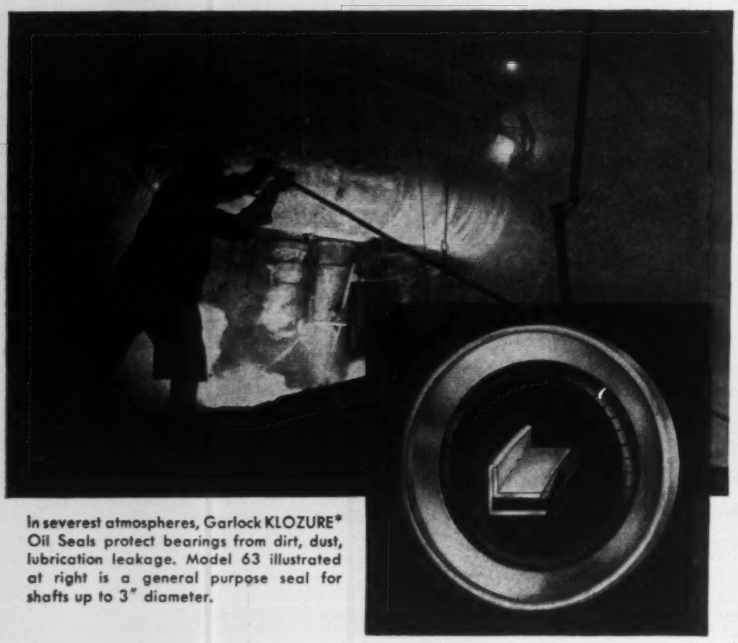
PORTAL—The precision flame planer of phenomenal accuracy widths from 100″ to 240″ for straight cuts or triple bevel. Edge preparation equal to machining at reduced cost.

Visit Messer Booth 504 at American Welding Show

CUTTING MACHINE DIVISION

AMERICAN MESSER CORPORATION, 405 LEXINGTON AVE., NEW YORK 17, N. Y.

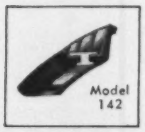
ENGINEERED OIL SEALS
for Steel Mills



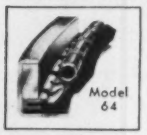
In severest atmospheres, Garlock KLOZURE* Oil Seals protect bearings from dirt, dust, lubrication leakage. Model 63 illustrated at right is a general purpose seal for shafts up to 3" diameter.

Where there is the slightest possibility of bearing damage due to oil leakage, apply Garlock KLOZURE Oil Seals.

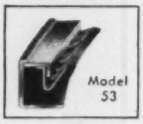
Everywhere in steel—on hot and cold strip mills, blooming and structural mills—Garlock KLOZURE Oil Seals prevent leakage of vital bearing lubrication. And they further prevent damage to the bearings by sealing out scale, spray, dirt, and other foreign matter.



For example, Model 142, a face-type oil seal, is designed to seal surfaces perpendicular to shaft . . . keeps water splash and scale out of bearings at the shoulder of mill rolls. Models 64 and 82 are applied



to large shafts at normal or high speeds . . . ideal for protecting bearings on back-up and work rolls. Model 53 withstands temperatures up to 250°F at normal or high speeds . . . recommended for table



rolls. Where equipment can't be dismantled easily, Model 23 Split-KLOZURES are the choice.

All KLOZURE Oil Seals are oil and grease resistant . . . impervious to water, mild acids, alkalies . . .

non-abrasive . . . withstand temperatures from −40°F to +250°F. For extreme conditions, Garlock furnishes sealing elements resistant to practically any fluid, and serviceable as high as +500°F.

Enjoy prompt "off-the-shelf" delivery. A new, nationwide stocking program places over 1800 standard stock items of Garlock KLOZURE Oil Seals near you. All you need is a telephone for quick service on a badly-needed replacement oil seal, or to replenish your current stock of seals. For the name and address of the authorized Garlock KLOZURE Oil Seal distributor in your area, call the closest of the 26 Garlock sales offices and warehouses

GARLOCK

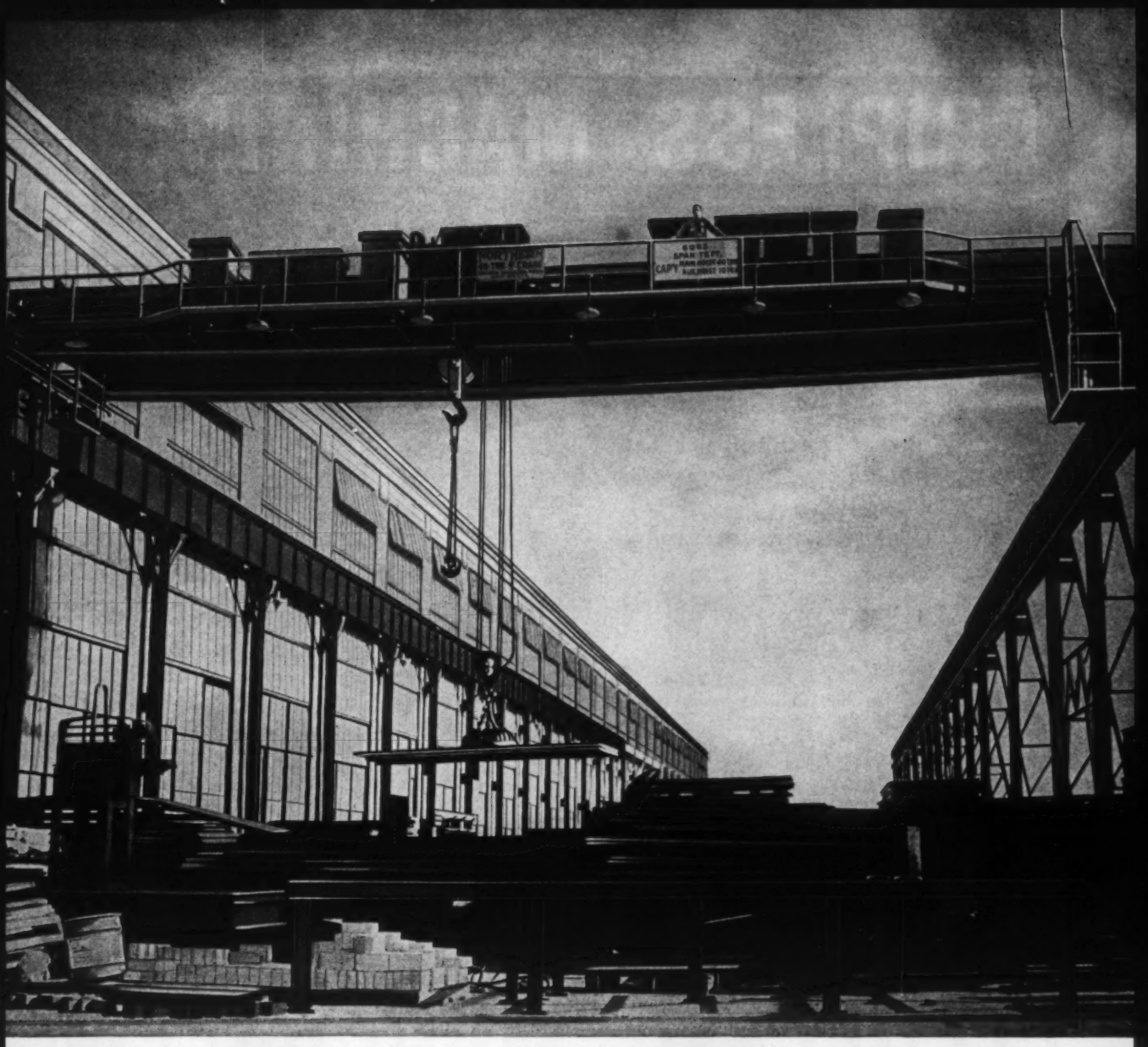
throughout the U.S. and Canada. Or, for further oil seal data, write for Catalog AD-181, Garlock Inc., Palmyra, N.Y.

Canadian Div.: Garlock of Canada Ltd.

Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*Registered Trademark



NORTHERN CRANES for heavy, continuous service in steel storage yards

This 40/10-ton, 75-foot span heavy duty magnet crane was designed for extremely severe service, and was equipped with newly developed electrical control equipment to provide maximum handling efficiency.

The above installation, in a large electrical equipment manufacturing plant, is typical of many similar Northern Crane installations in steel mills, fabricating plants, and like service in heavy industry.

Northern heavy duty cranes are designed and built to meet the most exacting requirements, providing for continuous service under severe operating conditions, handling maximum loads, and with high impact allowances. Mill type motors and controls provide highest electrical performance.

MATERIAL HANDLING EQUIPMENT BY NORTHERN

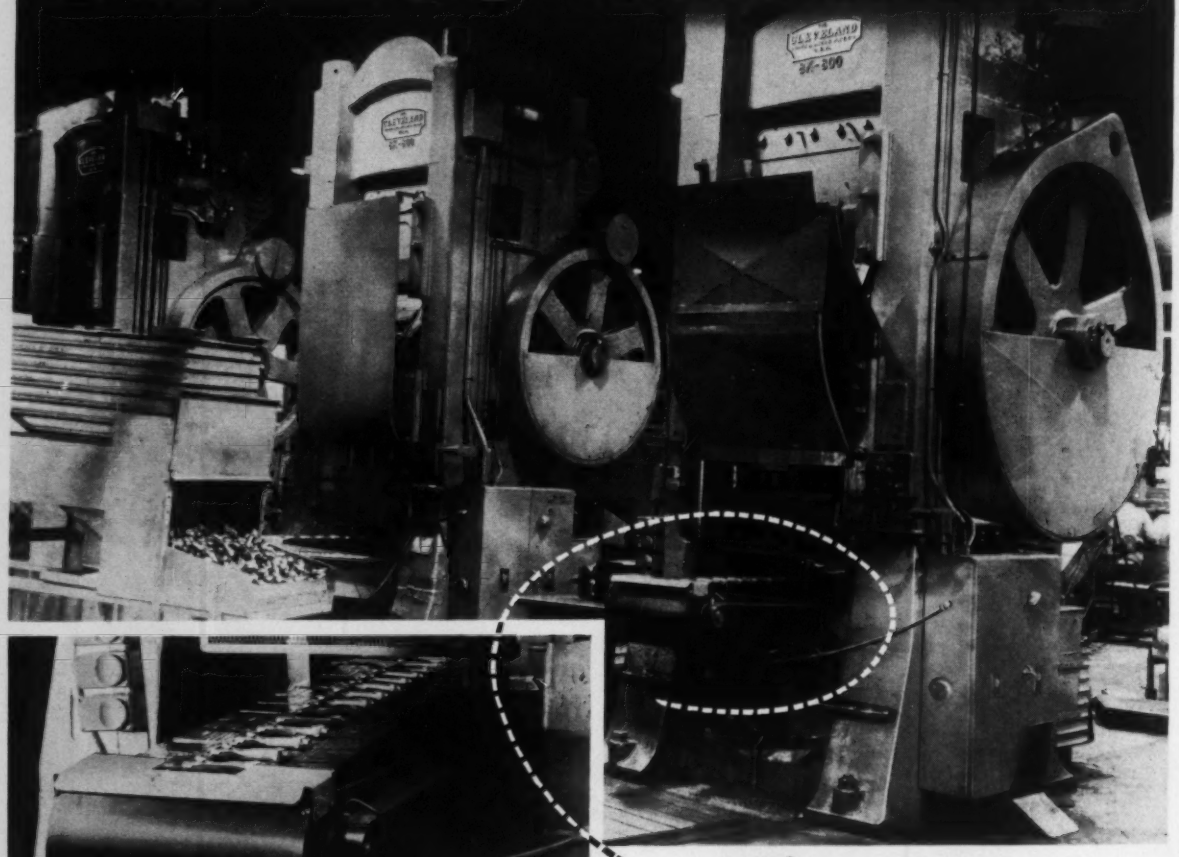
Sales representatives in all principal cities.

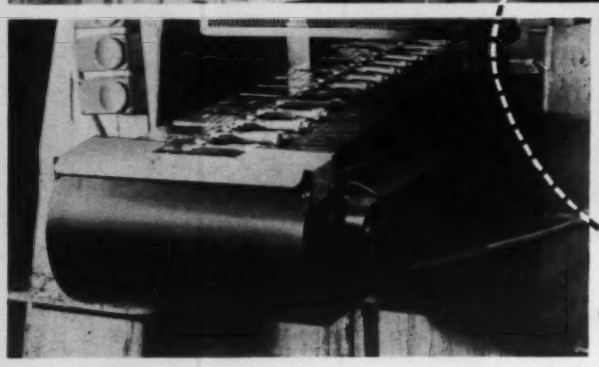
NORTHERN ENGINEERING WORKS
210 CHENE ST., DETROIT 7, MICH.

35-3006

look overhead . . . see "NORTHERN"

CHIPLESS MACHINING





A major manufacturer of 8-cylinder automotive engines cuts production costs by sizing and qualifying connecting rods with these Cleveland Presses.

CLEVELAND KNUCKLE JOINT PRESS

Fully automated with chain-type conveyor feed, these three 800-ton Cleveland Knuckle-Joint Presses eliminate expensive machining operations. Cleveland's massive, carefully fitted knuckles exert a "super" squeeze on the cold metal that straightens the part, sizes it to close tolerance of the order of .0005".

This "chipless machining" is cutting costs in forge shops and automotive engine manufacturers due to the greater accuracy possible with Cleveland Presses. Cleveland's long slide bearing surfaces and rugged frame construction hold deflection to a minimum under maximum load.

With capacities from 150 to 3000 tons and bed areas from 18 x 18" to 50 x 54", Cleveland Knuckle Joint Presses do the job efficiently, economically. Investigate the COST-CUTTING advantages of these Cleveland Presses by writing today for Catalog K2. A-4001A

OTHER COST-CUTTING CLEVELAND PRESSES

INCLINABLE • STRAIGHT SIDED CRANK • STRAIGHT SIDED ECCENTRIC • 4-POINT UNDERDRIVE • DOUBLE ACTION TOGGLE

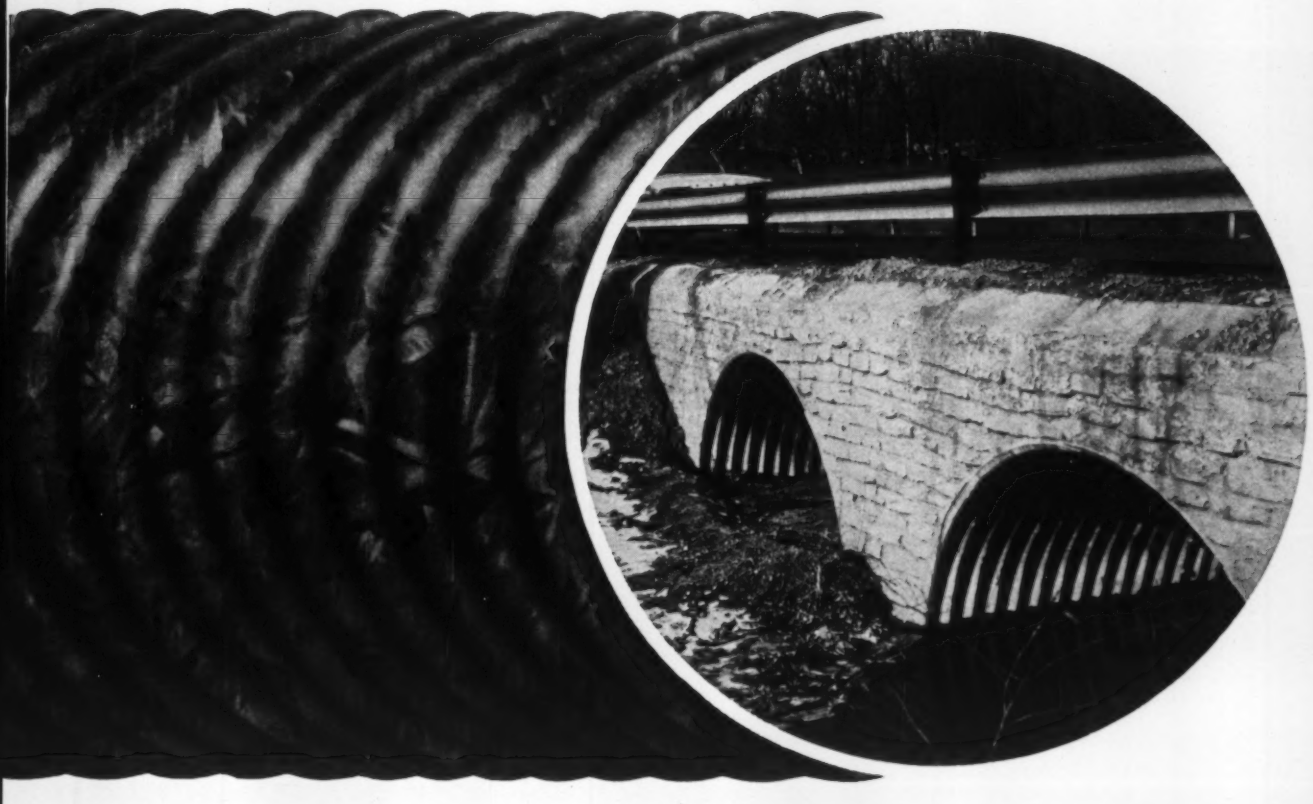
THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

Division of OHIO FORGE & MACHINE CORP.

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

Guardrails and culverts live longer . . .



GUARDED BY GALVANIZED STEEL

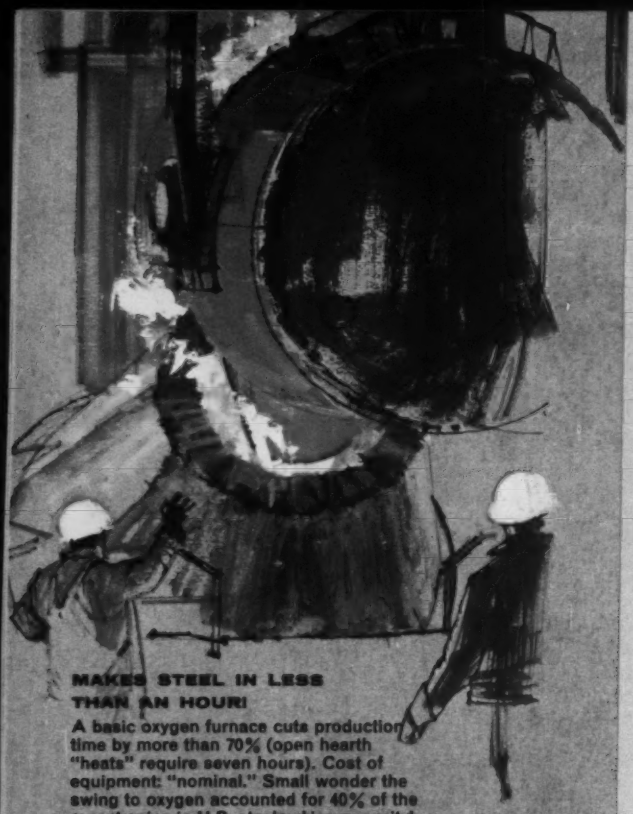
Wherever traffic or drainage flows, you'll find modern galvanized steel at work. In guardrails, for example, where nothing quite matches galvanized steel: the strength of the steel for impact; the coating of zinc for durability and ease of maintenance; the economy of the combination. And in culvert pipes, where the exceptionally high strength-weight ratio of this zinc-coated metal brings cost per year down to the barest minimum.

WEIRKOTE® IN PARTICULAR—You gain when you specify long-life galvanized steel for guardrail and culvert installations. And you gain even more when you specify National Steel's Weirkote. To the inherent strength of steel, Weirkote adds *enduring* zinc protection. Weirkote is manufactured by two National Steel divisions, Weirton Steel and Midwest Steel. For further details, write Weirton Steel Co., Weirton, West Virginia.

MIDWEST STEEL
Portage, Indiana

WEIRTON STEEL
Weirton, West Virginia

Divisions of
NATIONAL STEEL CORPORATION



MAKES STEEL IN LESS THAN AN HOUR!

A basic oxygen furnace cuts production time by more than 70% (open hearth "heats" require seven hours). Cost of equipment: "nominal." Small wonder the swing to oxygen accounted for 40% of the recent gains in U.S. steelmaking capacity!

ALL THE OXYGEN YOU WANT RIGHT NEXT DOOR!

With a Liquid Carbonic oxygen producing facility next to your steel plant, you are assured of all the oxygen you need. Here's a way to achieve all the advantages of an oxygen plant of your own without capital investment or operating responsibility. Contact your Liquid Carbonic representative for details.

DO YOU KNOW *the many places industrial gases can keep you ahead of competition?*

For example, here's what oxygen is doing for the steel industry alone: "BASIC OXYGEN PROCESS MAKES STEEL IN LESS THAN AN HOUR"; "OXYGEN CUTS PRODUCTION LABOR COSTS IN HALF"; "SLASHES COSTS OF STEEL-MAKING FACILITIES IN HALF." Each day, it seems, brings a new headline.

And the new applications come from all sides! New ways to use oxygen in smelting. New tricks in refining. New savings in tapping . . . cutting . . . welding . . . scarfing.

What next—for you?

One thing is certain: those who *do* keep up on industrial gas applications will keep a big step ahead of the competition. Three good ways: *first*, study your own operation for possible new applications of industrial gases; *second*, call on your Liquid Carbonic field representative to review these and other cost-cutting applications; *third*, watch for the new developments coming up.

You'll find them described in these pages as they develop—brought to you by Liquid Carbonic, *with the latest in industrial gas applications and distribution, from cylinders to large, on-site Liquidox® installations.*

LIQUID CARBONIC
DIVISION OF **GENERAL DYNAMICS**
135 South LaSalle Street Chicago 3, Illinois
In Canada: Liquid Carbonic Canadian Corporation, Ltd.,
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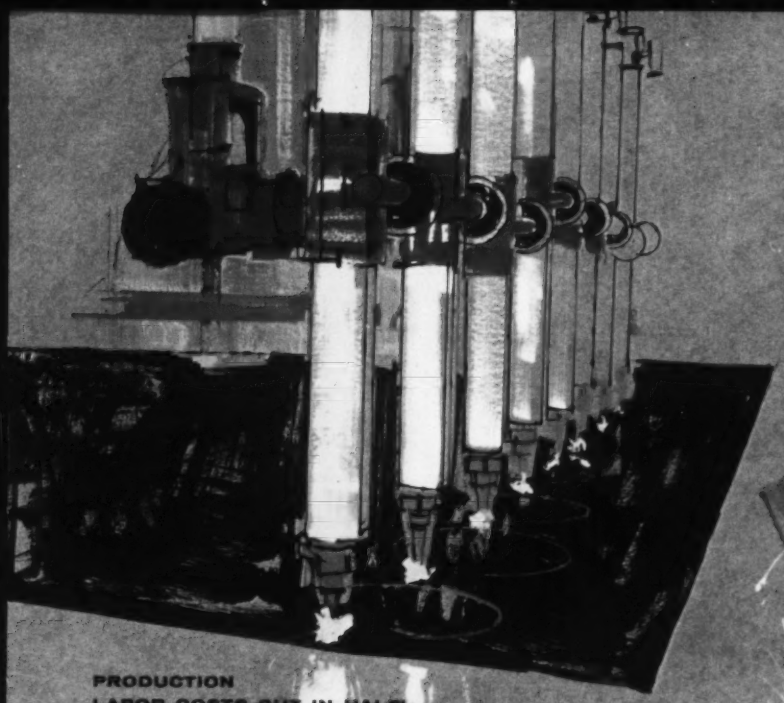

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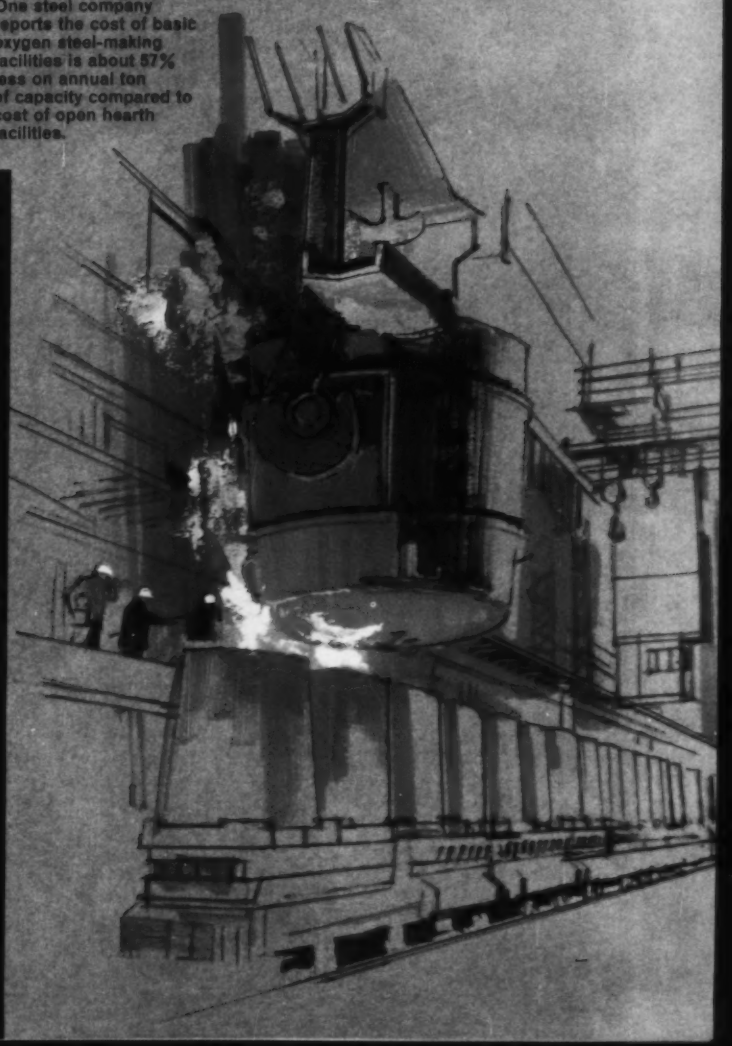
One steel company reports the cost of basic oxygen steel-making facilities is about 57% less on annual ton of capacity compared to cost of open hearth facilities.



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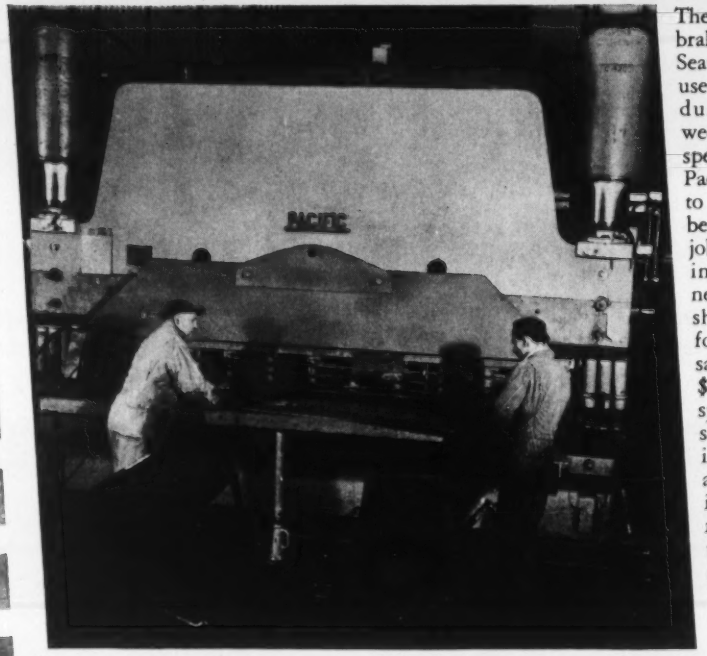

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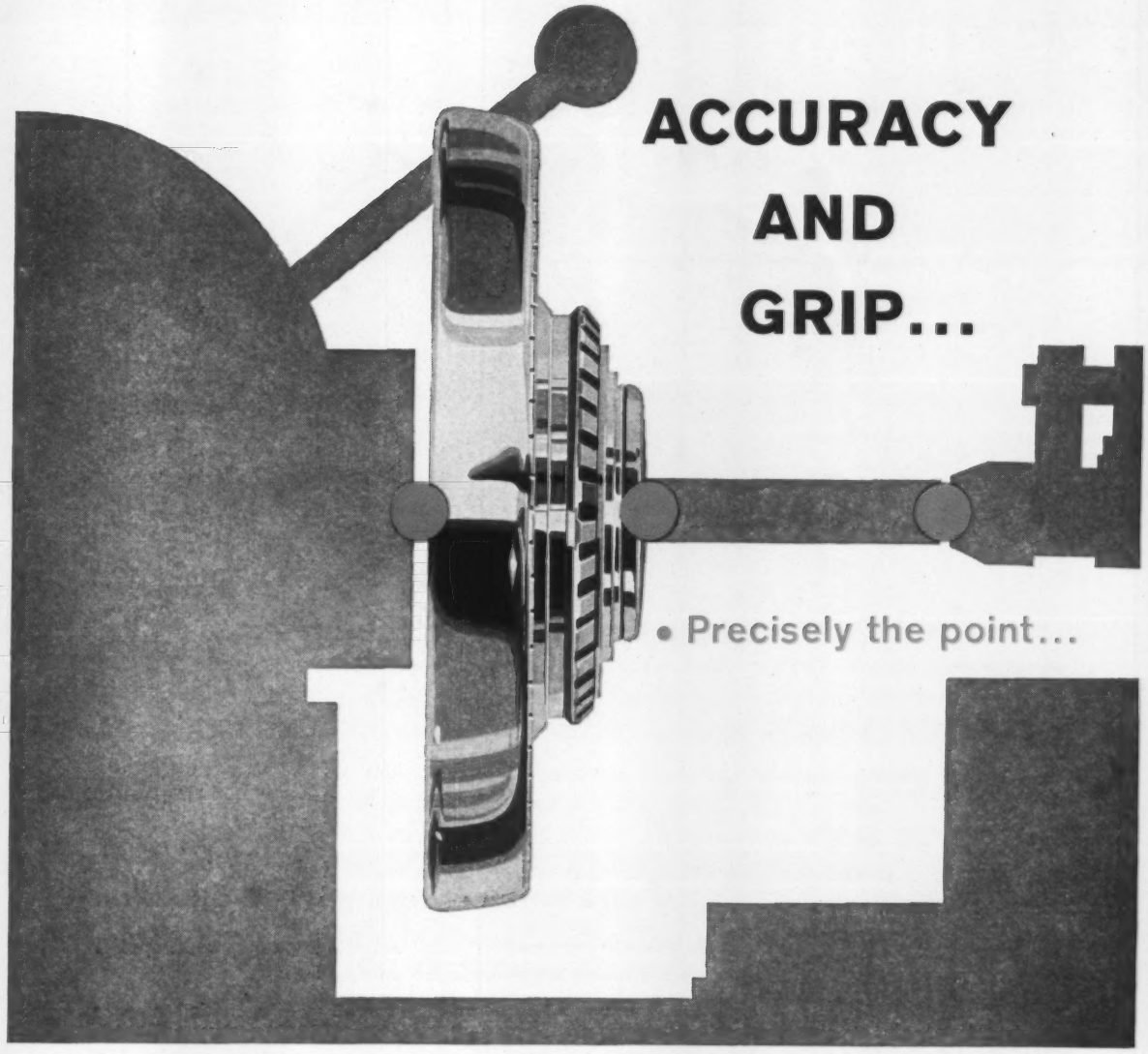

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SHIPMENTS FROM STEEL SERVICE CENTERS for the first quarter of 1961 will be upwards of 10 pct over the first quarter of 1960. This is the finding of a survey made by the Steel Service Center Institute. The key: End of inventory liquidation by customers.

HOME BUILDERS ARE CAUTIOUS about possible sales spur in the housing legislation now going through the congressional mill. They point out that much recent legislation is "permissive." Many house shoppers are still finding, and will continue to find, private mortgage sources asking for hefty down payments.

RETAIL SALES for the second week of March were up moderately over year ago levels. Sales gains were scored by TV sets and laundry equipment. Declines were felt in refrigerators and dishwashers. Total major appliance sales were down moderately.

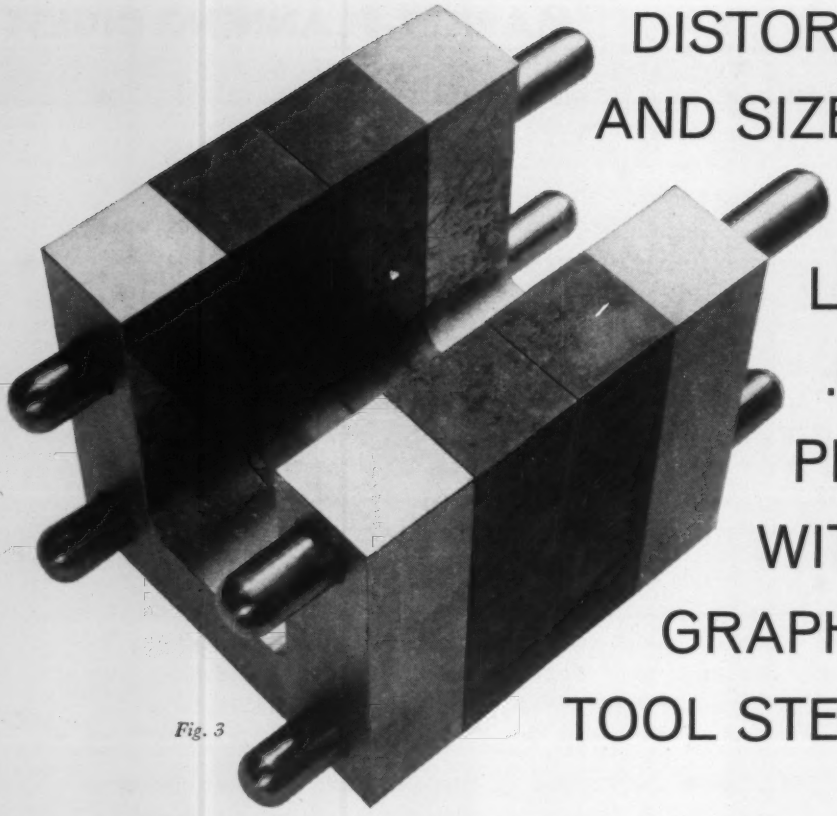
AUTO OUTLOOK BRIGHTENS. American Motors is now boosting Rambler production by 46 pct. The increase is based on a sharp upturn in Rambler sales. And Ford plans to increase output in the second quarter by 85,000 units over the first quarter.

NEW PRODUCTS AND PROFITS. Dynamics Corp. of America reports sales and profits rose in 1960 for a third straight year. Noted by board chairman: 20 new products developed in the year.

STRUCTURAL STEEL fabricating industry shipments for the first two months of 1961 totaled 461,758 tons. This is 3 pct better than for the same period last year. Bookings of 499,494 tons were down 2 pct from the same period in 1960.

BUILDING PERMITS issued in 200 cities in February showed a substantial dip in dollar volume compared to January. But the total was higher than February 1960, reports Dun & Bradstreet. The total in February came to $497 million, a dip of 8.4 pct from January, but up 5.5 pct from the year ago figure.

A MARKETING INFORMATION GUIDE supplement has just been issued by the Dept. of Commerce. Approximately 170 periodicals which are important sources of data useful in marketing research are listed and annotated in the supplement. Price is 20 cents and it can be obtained from the Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C.



DISTORTION AND SIZE CHANGE HELD TO LESS THAN .0002" PER INCH WITH GRAPH-AIR® TOOL STEEL

Fig. 3

The test pieces pictured here demonstrate the dimensional stability of Graph-Air® tool steel that enables users to produce more intricate tools and dies.

Fig. 1 shows test piece dimensions. In the "U" shape, which is particularly sensitive to distortion in heat treating, the machining tolerance between any two holes is held to .0002". After heat treating, the specimens are fitted together by four pins having a diameter of .0003" under .500". The total assembly error under these circumstances could not exceed .0008". Distortion must be less than .0002" per inch during heat treatment for the pins to fit.

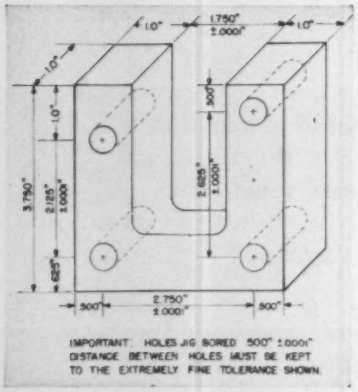


Fig. 1

The Graph-Air pieces tested were from different heats. They were air hardened from 1450°F. and double tempered at 400°F. Fig. 2 shows them as they pegged together easily, demonstrating no distortion. Fig. 3 top, shows the same specimens compared with two green, or as machined, parts. They matched perfectly again. *Graph-Air did not distort . . . did not change size.* Records indicate that no other tool steel passed this test when heat treated at its recommended hardening and tempering conditions.

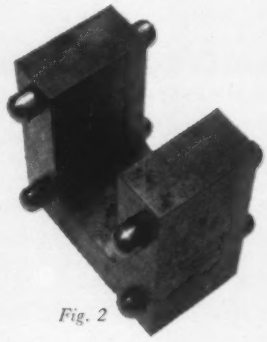


Fig. 2

Specify Graph-Air where minimum distortion and high quality are required. Solid and hollow bar sizes available. It is one of the Timken graphitic tool steels, the most stable tool steels made. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

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IN DEMAND: Technical trainees like these in instrumentation courses are urgently wanted by industry.

More and Better Trade Schools Needed to Boost Skills, Jobs

While unemployment stays high, so does the need for skilled and semi-skilled workers.

Faced with a growing lag in training, vocational schools are moving to improve and expand their programs.
By P. J. Cathey

■ "In the Philadelphia industrial area we have chronic unemployment of unskilled and semi-skilled workers. But we also have a rising and continued demand for skilled workers and technicians.

"We have jobs going begging, we have men and women who want to work. To meet this serious need, Philadelphia must establish an industrial training school. The community's public schools and other facilities cannot do the job."

This was the testimony of Thomas F. Morris, chairman, board of governors, Commerce and Industry Council of the Philadelphia Chamber of Commerce, before a Senate subcommittee on employment and labor.

Skill Paradox—Among skilled craftsmen needed, he said, are draftsmen, machine tool operators, welders, electronic assemblers, sheet metal machine operators, and maintenance mechanics. In all, fifteen types of skilled workers are in demand.

This employment paradox (true of many areas in the U. S.) raises several questions:

Are the nation's vocational schools falling down on the job? Are they turning out graduates industry can't use?

How Schools Serve—The answer has to be a qualified yes. But any analysis of the trade school must consider its role in training and the tools it's given to do the job.

Basically, the vocational school

operates in three ways: (1) high school day classes for those not yet in industry; (2) related instruction (mathematics, physics, electronics) for apprentices and other trainees; (3) classes for out-of-school youths and adults, both employed or temporarily jobless.

Most of the brickbats the schools receive are on the day school programs and the related training courses. The most frequent criticisms: Graduates are not equipped to enter apprentice training. Courses are not tied to industry's needs. There's not enough related training time. The schools are dumping grounds for poor students and misfits.

Supply and Demand—The training lag is critical when viewed against these facts: Industry's need for skilled workers keeps on increasing. In the building trades, for example, it's expected an additional 1.2 million skilled workers will be needed by 1970. (See chart.)

The people will be available. The number of workers under 25 will increase by 46 pct during the 1960's. But will they be properly trained?

Criticism, But—Many critics of the schools realize vocational educators are trying to do a big job with limited means.

Labor union men temper their criticism. "Within the limits set by financing, over-crowding and conditions over which the schools themselves have no control," says James A. Brownlow, president, Metal Trades Dept., AFL-CIO, "the schools are doing an excellent job in training youth for industry."

Educator's View — Vocational educators point out there's room for improvement.

James H. Pearson, assistant commissioner for vocational education, Office of Education, Department of Health, Education, and Welfare, reviews the situation this way:

"During the 1959-60 school year, in addition to related training for over 645,000 persons already employed, more than 300,000 young people were enrolled in preparatory trade and industrial courses.

"As in any educational program, there's always opportunity for improvement. One of the most important needs is setting up trade and industrial programs in communities not now served.

"Another need is adjusting courses to meet the technological developments taking place in industry. Many states recognize these problems and are taking action."

Industry's Approach — When companies can do so, they prefer to give related instruction to apprentices at the plant. A case in point is the Lester, Pa., Steam Division of Westinghouse Electric Corp.

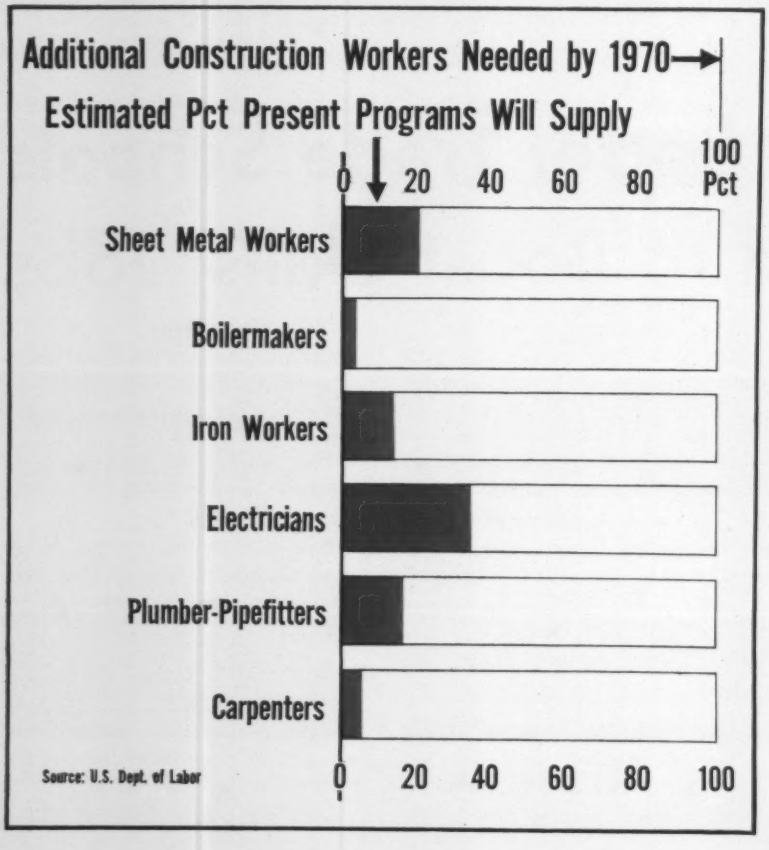
Formerly, its trainees took related training at a nearby high school. Now, under E. N. Baldwin, administrator, Trades Training Dept., all the courses are given at Westinghouse. In contrast to the established 144 hours of related training a year in the public schools, the Westinghouse course offers about 800 hours a year of such work.

But setting up and conducting a complete company-run training program is expensive. The Steam Div. trainees now have their own building with classrooms and machine shops. The building, fixtures, and equipment represent a $1 million investment.

Planning Ahead—About 120 employees are now in training. Plans call for a second shift to up-grade operators. A third shift will be used to train two year specialists.

Says Mr. Baldwin: "Related class training is concentrated in the first two years. More time is allotted to class work than the minimum re-

How Training Gap Will Hurt



quirements for the previous full four-year course. This is done so that the trainee can understand the relation of his class work to his shop work."

Many companies can't afford such a program. Others are neglecting training entirely.

Jersey Survey—In 1960, the Bureau of Apprenticeship and Training, U. S. Dept. of Labor, conducted a training survey in New Jersey. Out of 38,000 companies employing four or more workers, only about 6100, or 16 pct, had training programs. Only 12 pct of these programs were run by training directors.

As a follow-up on the New Jersey survey, the BAT will launch a nationwide study this month.

Changes Underway—Vocational schools are also undergoing study and change. Lowell A. Burkett, assistant executive secretary, American Vocational Association, points out some of the trends:

There's greater effort to fit vocational programs more closely into academic programs.

Some technical schools are admitting students strictly on the basis of aptitude, regardless of their grade levels.

Better methods are now used to screen students for entrance into vocational courses.

The Area Approach—One of the most interesting developments is the area vocational school.

Technical instruction is difficult in areas where there are not enough funds to build shops and classrooms, and buy equipment. Often, restricted locations can't furnish enough students to make a full-scale program worthwhile. They can't afford specialized teachers, supervisors, counselors, and administrators.

The area vocational school looks like the answer. It combines in one location all the equipment and teachers needed to instruct youngsters from many scattered school districts.

Price Fixing (Round II)

■ Philadelphia will probably be long-remembered as the home base of Ben Franklin and of the Federal government's successful prosecution of most of the U. S. electrical industry.

Now, although they may not rate national headlines, the area is again astir over two more price-fixing cases.

Haircuts and Milk—The most intriguing is the case of one Vito Capaccio. Mr. Capaccio is a barber who is charged with posting a sign in his window offering a "father and son special" at $2.50, and with another equally horrendous effort to stimulate business.

The most significant case is a decision by the State Milk Control Commission setting the price of milk in gallon jugs, and fixing minimum—but not maximum—prices on quarts.

Bay Rum Ban—As far as barbers are concerned, Mr. Capaccio's offense was that he ran into a state law which prohibits the posting of barbershop prices visible from the street. He was also charged with circulating handbills offering free bay rum facials with every haircut.

This, said the State Board of Barber Examiners, constituted "unethical or dishonest practice." It ordered him to close his shop forthwith, which he did right in the middle of a haircut. Later, he got a lawyer who advised him to resume cutting hair.

The nut of the matter here is that other barbers in Mr. Capaccio's town are trying to hold the price at $1.75 per haircut. Aiding and abetting them is the State Board of Barber Examiners. It is interesting to note that the Board is made up of five members, all of them working barbers.

All Cream?—The case of the milk jugs isn't quite as funny. The State Milk Commission has been laboring over it for nine months. What it finally gave birth to is less important in money than it is in principle.

It ruled that milk can be sold in gallon jugs at 91¢. That's a minimum; no maximum is set. Duke Kaminski, writing in the Philadelphia "Evening Bulletin," notes that "at 91¢ it seems like a bargain, but in those states where free competition and not state price fixing prevails, you can buy it for less."

He says that in Columbus, O., the gallon jug sells in stores for 69¢ to 74¢; in Washington the Kennedys' and everyone else can buy it for 86¢; and in Boston the price is 74¢.

Fixed Loss?—To get back to the electrical industry case. One of the convicted companies will defend itself against damage suits by a rather simple device: It will show that the division responsible for the conviction lost money in both of the years involved in the case.

Losing money seems like a tough way to stay out of trouble. Most of the other 28 companies involved in the federal case against the electrical companies may not be able to separate out their figures to show they made no exorbitant profits, if any.

Sour Sauce—So if a "lost" defense seems like doing things the hard way, consider the problem of people with long hair who drink milk. Here, as in countless other instances throughout the country (and let's not get into labor) the government "protects" the seller—not the buyer.

There seems to be some rule that says you can't use the same sauce for the goose as you do for the gander.—**G. F. Sullivan**

Does Research Go Far Enough?

Manufacturing Is Often Overlooked on R&D Team

The life expectancy of products developed today is only half of what it was 10 years ago.

To get the best return from them, manufacturing costs must be considered from the start.

■ Booming research and development outlays by U. S. industry must be extended to manufacturing research, or the outlay is wasted. This conclusion was reached at the American Management Association's first manufacturing research meeting.

New products which had a 10 to 15 year life expectancy in the 1950's, can't hope for much more than half that period in the 1960's. And some new products must expect a profitable life span of no more than one year, researchers point out.

The only solution, they believe, is to bring manufacturing engineers into the early design stages of a new product.

Put Talent to Work — Foreign competitors are already adopting manufacturing cost as a basic element of new research plans as well as new marketing plans, according to H. H. Bixler, of General Electric Co.'s manufacturing engineering services.

To put top engineering talent to work on the problem, GE has created a central manufacturing laboratory. It backs up cost-cutting efforts by manufacturing engineers at each of its plants.

Adolph Kastelowitz, Republic Aviation Corp., suggests that the manufacturing engineer work with the designer of a new product, as well as with top company officials. He can supply current information on new materials and the most economic methods of working these new materials.

A GE rule of thumb: If a new manufacturing process doesn't offer the chance to cut costs by 80 pct, forget it. It's not worth the trouble. Even with this rigorous a requirement, manufacturing engineers are overloaded with projects at this company.

There Are Dividends — If that's the case, farm out your manufacturing research, suggests Dr. Joseph Harrington, Jr., Arthur D. Little, Inc. If you have no research department of your own; if you need an outside point of view; if you need special talent, or if your own manufacturing engineers are overloaded; then outside help is in order.

Good liaison between manufacturing research and the new product research department can pay unexpected dividends, according to E. F. Dertinger, Raytheon Co. High-quality manufacturing methods may boost your product price 5-15 pct, though the reverse is usually true. But users will find 20-25 pct production savings in using products from a high-quality manufacturing line.

In turn, their own customers can show maintenance cost reductions, over the life of the product, of 10 to 30 times original cost. This angle of selling has been almost unexploited in recent years.

Foreign Lesson — However, foreign competition is eager to equal or better U. S. manufacturing methods. And it is putting relatively more capital equipment on the latest models into its plants.

Says International Business Machines' W. A. Stadtler, "Despite the low labor costs, Japanese manufacturers have felt obliged to boost productivity 300 pct in the 1953-57 period.

"U. S. manufacturing engineers no longer have time to devise optimum manufacturing methods—unless manufacturing is acquainted with a proposed new product while it's still in the research stage. If they're not, no matter how good the product, obsolescence is so rapid that you'll miss peak sales and full profit potential."

Get Manufacturing on the Team

Top U. S. corporations suggest getting manufacturing research into the new-product team. They say it's a must in order to keep up with the short life span of today's new products.

Here's how they do it:

1. Put a **manufacturing research man** on the **new product evaluation** committee.

2. See that feedback of field evaluation of new products reaches the **manufacturing research team** as quickly as it reaches **quality control or top management.**

3. Put at least one member of the **manufacturing research team** at **staff-level meetings.** Or at least see that he's in touch with staff level information and decisions.

4. Include a **manufacturing research man** in the **new products research team.** Or at least have one at new product meetings.

AUTOMOTIVE SHEETS: On the surface, automakers want them the same for a uniform finish.

Automakers Demand Finer Finish

Last fall the steel industry was put on notice that automakers wanted more uniform surface finish on cold-rolled sheets.

Improvement programs are well underway. And there is evidence of significant progress.
By T. M. Rohan

■ One of the biggest refinements in surface finishing of cold-rolled sheet steel is quietly taking place in the steel industry. It's aimed at uniform quality. And it's being pushed along with the prodding of quality-conscious automakers.

Last fall Ford Motor Co. started the project with a dozen or so Midwest mills by handing out small samples of steel. One sample had a fine finish, another had a slightly coarser finish.

Mill representatives were told that by March of this year, all outside body sheet sent to Ford was to have a finish within the limits of the samples.

They Mean Business—In the past few weeks, automakers have shown they mean business. They have rejected some shipments based on finish. General Motors Corp., Chrysler Corp., and the independents are all involved in surface finish projects.

Steel producers currently involved in the program include Armco Steel Corp., Bethlehem Steel Co., Ford's own steel mill, Inland Steel Co., Jones & Laughlin Steel Corp., Republic Steel Corp., Sharon Steel Corp., U. S. Steel Corp., Wheeling Steel Corp., and Youngstown Sheet and Tube Co.

The Society of Automotive Engineers formed a committee to seek out a set of standards. Rather pointedly, it's called "Iron and Steel Technical Committee on the Problem of Surface Texture." The American Iron and Steel Institute also has organized a subcommittee to tackle the problem.

Surface Detective—Republic Steel's Electro-Mechanical Research Div., at the request of AISI, has developed an accessory for the Brush "Surfindicator."

The device counts the number of "peaks and valleys" in a given area of sheet. This makes possible a numerical standard rather than visual sample comparisons. The "Surfacount" is under evaluation. It will be built by Control Devices, Inc., Birmingham, Mich.

Will It Be "Extra"?—Some people within the industry predict a whole new set of workable standards for the surface textures for autos, appliances, and other uses, is on the horizon.

Mills hope, privately, of course, that if a workable accurate system of measurement can be developed, they will be able to insist on a price "extra."

For one thing, it means much closer control and upgrading of shot-blasting of mill rolls. This is especially true for the final stand which imparts surface texture.

Under present measurements, surfaces can "read" the same, yet look different. And some feel even the new "peak-and-valley counter" is not the whole answer.

But the automakers' chief concern is to get uniform sheets.

Thermoelectric Comes Of Age

Companies Start Selling; Others Double R&D Outlays

The age of practical thermoelectrics has arrived.

Thermoelectric units are being sold commercially now. Companies are doubling R&D outlays. Buyers are supplying ideas.

By K. W. Bennett

■ Thermoelectric devices is a helter-skelter market, still in the basic research stage.

But U. S. businesses are rushing in where bankers might fear to tread. Millions of dollars already have gone for research and development of thermoelectric devices. With the upswing just beginning, some companies will double their R&D outlays this year.

Biggest Ever—In December, 1960, Westinghouse Electric Corp. delivered to the U. S. Navy the biggest thermoelectric generator built to date. It delivers 5000 w. It has no moving parts and needs only heat to begin giving off 10 v electricity at 50 amps, or 120 v at 42 amps.

Carrier Corp. is reported at work on a generator of equal size.

Other new thermoelectric devices are: Prototypes of a 7x2 ft wall panel that can heat or cool a home; and a deep freeze unit with no moving parts.

What Is It?—If two metals are joined and a current passed through the junction, the temperature will rise or fall in the junction depending upon the direction of current flow. It will fall low enough to freeze water, or climb high enough to boil water.

If two semi-conductors are joined and the junction is heated, electric current flows from the junction. This is a thermoelectric device. It can be a heatpump, or can be built as an electric generator.

High Costs — On the surface, thermoelectric costs appear high. Even as a heatpump, it's no money saver. But the devices are gaining ground, and at a pace that's startling.

Several thousand small devices are already installed in home furnaces as automatic heat regulators. Furnace heat generates enough electric current to operate furnace gas valves.

Thermoelectric "transistor coolers" are now standard military hardware.

Metals Used — Lead telluride is often used in the junctions. Bismuth telluride shows promise. Under study are lithium, copper and manganese oxides, and silicon carbide.

A combination of metal with an organic compound, perhaps benzine, has been suggested as the ideal material.

Mass Production—A. O. Smith Co. is now using thermoelectric devices at the rate of 13-14,000 per month. It started in January this year.

Thermoelectric units are used as cathodic protection devices in home hot water heaters. Smith Co. explains it is not using the device on all hot water heaters produced. It boosts the selling price slightly.

Major Contenders—Westinghouse, Minnesota Mining & Manufacturing Co., and the Martin Co. are the current leaders in thermoelectrics.

THERMOELECTRIC GENERATOR: D. W. Gunther, right, of Westinghouse, and S. R. Milliken, of Northern Illinois Gas Co., examine one of the first thermoelectric generators for industry.

Westinghouse offers four "off the shelf" power generators that can produce 5, 10, 50, and 100 w. The 5-w unit costs around $300; the 100-w, about $1000.

Minnesota Mining is still researching and producing thermoelectric heating and cooling devices. But it is moving strongly into thermoelectric power generation.

Massive R&D—Industry sources estimate $30 million will be spent this year by 40 research and development departments on a product with sales close to zero now. It has no apparent consumer and industrial markets. The government is the major consumer.

Other varied companies researching and selling thermoelectric devices include: General Electric Co.; Texas Instruments, Inc.; Minneapolis-Honeywell Regulator Co.; Whirlpool Corp.; Norge Div., Borg-Warner Corp.; and Carrier Corp.

Gas Systems—Twelve gas companies are working with Minnesota Mining to put a thermoelectric generator in home gas-fired furnaces. The furnace will generate enough electric current to operate its own blower fan, or a water pumping unit for hot water heating systems.

Paying Off—Even at this early stage, large R&D outlays are paying off in cost savings. Researchers say that at current prices, thermoelectric generators can compete with battery and gasoline generators in the 100 milliwatt to 100 w power range.

Appliance makers already are watching the potential to reduce refrigerator costs. Laboratory instruments, where precise heat control is imperative, offer another prospective market.

Automatic Step—Next move for thermoelectric elements is automatic manufacture. Westinghouse and Minnesota Mining have made mild steps in this direction.

The stunt stage is past. The thermoelectric device is drawing commercial and industrial buyers. And they are supplying their own application ideas.

Rocket Speedup Tops New Space Program

A speedup in development of powerful space rockets keynotes President Kennedy's new space exploration program.

The President's expanded program will cost $1.24 billion in the year beginning July 1, compared with $1.11 billion proposed by former President Eisenhower.

A total of $81.6 million would be spent for faster development of the Centaur and Saturn rockets.

Nuclear Power—Other increases include $9.3 million for liquid propulsion space vehicles, $4 million to develop nuclear power plants for space, and $10 million for communications satellites.

The satellite increase apparently will take the place of $10 million Gen. Eisenhower anticipated would come as reimbursements from private industry. President Kennedy did not include these.

The rocket speedup is for both manned and unmanned exploration of space.

Big Increases—Budget funds for the Saturn are an increase of $56 million over the $168 million asked by Gen. Eisenhower. A $25 million increase for the Centaur almost doubles Gen. Eisenhower's proposal for the project.

National Aeronautics and Space Administration officials are pleased at the space budget expansion. They say it represents a "strong and vigorous space effort."

However, they hint that even more changes in the space program may be in the offing.

U. S. Steel Sets Fund For $300 Million

U. S. Steel Corp. is borrowing $300 million, through the public offering of 25-year sinking fund debentures.

The proceeds will restore capital expended in the expansion and modernization program. They will also be used for future property additions and replacements.

Roger M. Blough, chairman, says the fund will be used in developing and producing new sources of iron ore and other raw materials. The company is also building new facilities for the manufacture of new products and the use of new techniques developed in the research labs. Tool replacement and other expansions are also affected.

Inland Steel Plans Plant Additions

Two major building projects are scheduled this year by Inland Steel Co. for its Indiana Harbor Works in East Chicago, Ind. They include a foundry for casting molds in forming molten steel into ingots, and a plant to produce electrical power and steam.

The foundry would produce 150,000 tons of molds per year, enough to meet company needs at capacity levels of operation.

UAW: GM Extends SUB

The United Auto Workers have reached an agreement with General Motors Corp. that will extend Supplemental Unemployment Benefits paid to eligible laid-off GM workers for additional 13 weeks. Payments parallel benefits under the new Temporary Extended Unemployment Compensation Act. Ford Motor Co. will also extend SUB.

52 Pct Of Iron Ore Beneficiated in '60

A record 52 pct of all domestic iron ore was beneficiated in 1960, American Iron & Steel Institute says. Iron ore beneficiation has increased 100 pct in the past 10 years.

More than 94 million net tons of iron ore for blast furnaces went out from U. S. mines last year, compared with 65 million tons in 1959. Twenty new beneficiating plants have been put into operation at or near mines, raising the total to more than 90 now.

Close-ups Of
INDUSTRIAL JAPAN

Part 3

Japan Fights Raw Materials Gap

If Japan is to meet its 10-year industrial growth schedule, it needs new sources of materials.

Right now, Japanese representatives are solving the long-range problem.
By Tom Campbell

■ The heart of the Japanese 10-year program is its steel industry. But support for that industry must, in a great measure, come from imported iron ore, coking coal and, to a lesser degree, scrap.

Without these raw materials, the target of 48 million tons of steel a year cannot be met by 1970. And without steel, the great upsurge of Japan's industrial activity can not be reached. But the odds are overwhelmingly in favor of success.

Ore Ventures—At present, Japan imports 65 pct of its iron ore. The biggest share comes from Malaya and India. Goa and the Philippines come next and other nations such as Canada and the United States account for the rest.

Japan cannot do much about increasing its own iron ore supplies. And some of the present suppliers will not be able to step up the present tonnages by any great extent. The result will be greater dependence on South America, India, Africa, Canada, Alaska—and perhaps Red China.

The Red China Issue—There has been much speculation that Japan may import large tonnages of ore from Red China—a prewar source of a fair amount. But intensive talks and investigations indicate Japan will not get much ore from Red China for some time to come. The reason is simple: Red China needs it for its own expansion. Also, much of the Chinese ore will not be of sufficient quality for the ambitious Japanese.

In bringing more ore from abroad (a total of 45 million metric tons in 1970 compared with 14 million tons in 1960), Japan must make a barth of new agreements and establish new sources. Also, Japan must, in order to keep costs down, use the latest methods of beneficiation, pelletization, and, in many cases, concentration of lower grade ores.

Deals in Progress—Some of the deals are already in progress. A major one involves India's Rourkela mine where Japan hopes to obtain nearly 2 million metric tons of 62 pct Fe iron ore per year from 1964 on. Japan has made another agreement with India for a joint development of Bailadila mine in India. Japan is to import 4 million tons of ore from that mine per year for 15 years from 1966.

But need for more ore is mounting and Japan can't always wait until some of the developments such as those in India are consummated through financing, construction and shipment. It is expected that Japan will figure prominently in the sale of some of the Lamco ore in Liberia when that project gets under way in a few years. The big problem is ore carriers. So Japan must embark on a large-scale building program of bigger ore carriers if transportation costs are to be cut.

To Cut Costs—Recent thinking in some Japanese quarters suggests that ore may be beneficiated, concentrated, or pelletized at the source of supply. This would cut down freight costs, which represent 40 pct of the total costs of Japan's imported ore.

One little item picked up here is the fact that Japanese metallurgists are studying intently the problem of separating chromium from the laterite ores of the Philippines. If they are successful, then a large share of their ore worries are over. Apparently studies have progressed about as far (possibly farther) than those of an American company which had large laterite holdings in Cuba before Castro changed all that.

The major conclusion on iron ore is that Japan will be greatly dependent on other nations for ore. Although Red China and Soviet Russia may become suppliers to Japan, the time seems to be far in the future.

Coke a Problem—The next biggest raw material problem for Japan is coking coal. It's talked about at every visit to every Japanese mill. At present, Japan imports more than 6 million tons of coal a year and is supplying but 5 million tons from

NEXT WEEK

The Steel Industry

Part 4 of this series on industrial Japan analyzes the plans and goals of the nation's ambitious steel industry. A major question discussed by Editor-in-chief Campbell: How can this island nation double its steelmaking capacity in the next 10 years?

domestic mines. In the future, the sharp increase in molten metal needed for new steelmaking units means a gigantic stepup in coking coal needs.

By 1970, Japan will be importing 22 million metric tons of coking coal. More than 50 pct will come from the U. S. Japan's metallurgists have been loud in their praise of American coking coal. Japan is making plans to open up collieries in Alaska and Australia. But the bulk of the coking coal required by the 10-year plans will come from the U. S.

Now Scrap—Japan has always, particularly in recent years, worried about dependence on the world scrap market. So much so that at times it has been an obsession. Last year, Japan took close to 4 million metric tons of scrap and the same tonnage is being booked for this year.

But the plans for iron ore, increased hot metal, and more oxygen steel plants have signed the death knell for large scale increases in scrap imports. There just won't be any more increases. By 1970, Japan will be importing less scrap than last year.

The Job Ahead—Citing the mere facts of the iron and steel industrial growth does not properly portray the size of the job ahead. All types of technical assistance programs have been made. More are coming. The deals in coal have not all been consummated to the point where Japan knows where all the coal for the complete 10-year program is coming from.

The search for iron ore has only begun. And since Japanese business and government people indulge in long and detailed transactions, it will be some time before the deals are completed. Teams of Japanese are everywhere in the world making iron ore, coal, and scrap deals. Only recently the scrap problems were discussed in Tokyo, with decisions in meetings which have been reflected in U. S. scrap prices.

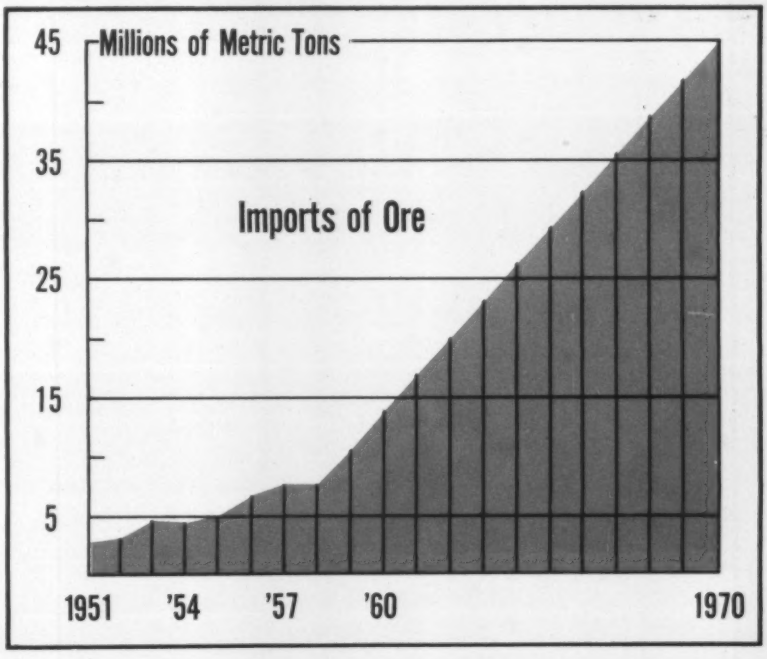
U. S.'s Role—Japan favors American machinery, but the Germans, British, and others are swarming into this nation as the magnitude of the raw material problems and the need to import finished machinery (and technical assistance) are realized.

This is one area where Americans are not lagging. But the job is tough. Not only are Americans meeting stiff competition from other nations, but U. S. businessmen are competing viciously with each other to get the business.

This is but a taste of what is ahead as Japan scours the world for raw materials and machinery to furnish the wherewithal for its 10-year program.

COMING IN: Much-needed coal comes into Japan. Scene is coal depot at Toyosu Pier in Tokyo harbor, designed especially for handling coal.

Ore Imports Will Climb Sharply



INDUSTRIAL BRIEFS

Office Growth—Camloc Fastener Corp., Paramus N. J., has moved its western division offices to larger quarters in Los Angeles.

New Enterprise—Alex Englander, owner and president Empire Steel Corp., Denver, has formed a new enterprise, Columbine Pipe & Tube Co., and a subsidiary, Columbine Supply Co.

Another Change — Long-Lok Corp., Santa Monica, Calif, has made its third move in five years, to Los Angeles. The new building occupies a 17,000 sq ft area.

Florida First—A new company, Rex of Florida, Inc., is operating Florida's first commercial heat treating facility in Fort Lauderdale. A subsidiary of J. W. Rex Co., Lansdale, Pa., Rex of Florida is operating 18 furnaces and five quench tanks.

Electrical Growth — Brand-Rex Div., American Enka Corp., is building a new 40,000 sq ft plant at Gardena, Calif. It will manufacture military and commercial wires and cables for the West Coast.

Glass Fiber Plant — Pall Corp., Glen Cove, N. Y., through its subsidiary, Fibrous Glass Products, Inc., is building a $1.8 million plant at Wilkes-Barre, Pa. The integrated glass making and fiber drawing plant will have a capacity of 10 million lb per year.

Research Starts — Philco's Research Div. has completed its new suburban research center in Blue Bell, Pa. The center covers 200,000 ft on the 25-acre site.

Coastal Expansion—Read Instrument Bearing Co. Div. SKF Industries, Inc., is building a $2.5 million plant at Los Angeles. The single story facility is located on a 10-acre tract.

Kentucky Move—The plant of Magnatronics Inc., subsidiary of Crucible Steel Co. of America, is nearing completion at Elizabethtown, Ky. It will produce ceramic permanent magnets for the electronics industry.

Foundry Closing — General Electric Co. is closing its foundry in Everett, Mass. Most operations will be transferred to Schenectady by the end of the year.

Sales Switch — Parker-Hannifin Co. has moved its southwestern region sales office for industrial components from Los Angeles to Culver City, Calif.

Research Project—A new company, the Tyler Wayne Research Corp., Cleveland, has been formed by the W. S. Tyler Co., Cleveland, and Fort Wayne Metals, Inc., Fort Wayne, Ind. It will research, hold patents and license a stainless steel wire process jointly developed by the companies.

Isotopic Power — Royal Industries, Inc., Los Angeles, has received an Atomic Energy Commission $130,000 contract to design and manufacture an isotopic power supply to provide five watts of energy continuously for 10 years without recharging.

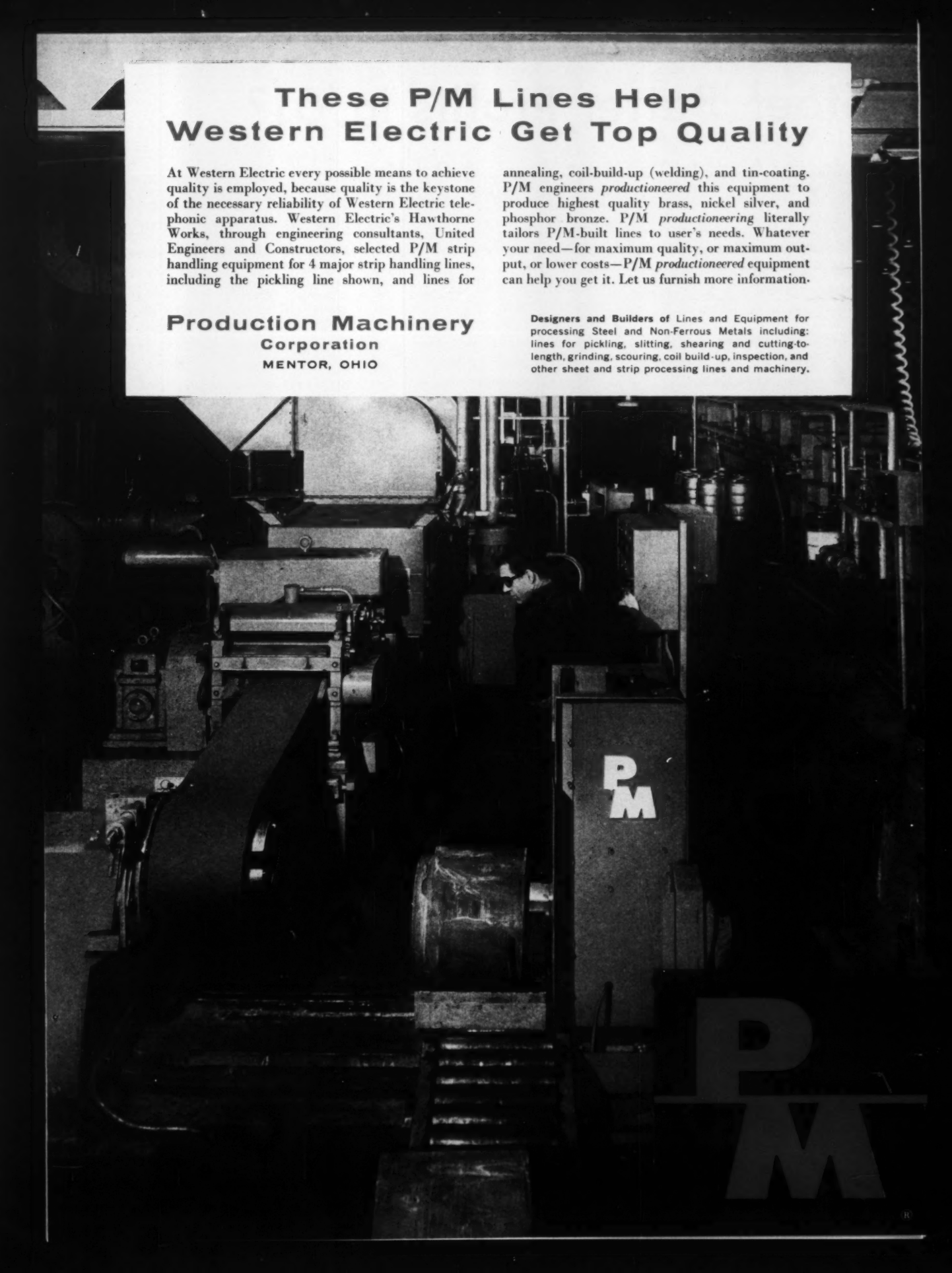
Alternating First—United States Steel Corp. has awarded a contract for the current conductor system at its new Gary plate mill to Ringsdorff Carbon Corp., East McKeesport, Pa. It is the first time in the steel industry that alternating current will be used to supply cranes of such magnitude and extent.

Alcoa Presents—Aluminum Co. of America has developed a new lightweight expandable aluminum beam for supporting forms during concrete casting in building construction. It will be sold by Hice Corp. of America, New York.

Curtain Wall — United Steel Products Co., Trenton, N. J., has developed a new curtain wall system utilizing metal covered composite reinforced concrete mullions. The system provides an outside covering that acts also as a form for a prepoured reinforced concrete column.

J&L Adds 59 Smokeless Coke Ovens

NEW BATTERY: The Pittsburgh Works, Jones & Laughlin Steel Corp., has installed a new battery of 59 by-product coke ovens. Another 59 ovens were built in 1960, with 118 more due by the end of this year.



These P/M Lines Help Western Electric Get Top Quality

At Western Electric every possible means to achieve quality is employed, because quality is the keystone of the necessary reliability of Western Electric telephonic apparatus. Western Electric's Hawthorne Works, through engineering consultants, United Engineers and Constructors, selected P/M strip handling equipment for 4 major strip handling lines, including the pickling line shown, and lines for annealing, coil-build-up (welding), and tin-coating. P/M engineers *productioneered* this equipment to produce highest quality brass, nickel silver, and phosphor bronze. P/M *productioneering* literally tailors P/M-built lines to user's needs. Whatever your need—for maximum quality, or maximum output, or lower costs—P/M *productioneered* equipment can help you get it. Let us furnish more information.

Production Machinery Corporation
MENTOR, OHIO

Designers and Builders of Lines and Equipment for processing Steel and Non-Ferrous Metals including: lines for pickling, slitting, shearing and cutting-to-length, grinding, scouring, coil build-up, inspection, and other sheet and strip processing lines and machinery.

Steel: Better Profits in '61?

Industry Aims to Top Last Year's 6 Pct Return

Although operating at reduced capacity, the steel industry still had more than a 6 pct return on its investment in '60.

The profit squeeze continues. But steelmakers are trying to equal or top that level.
By G. J. McManus

■ In 1960, the steel industry showed how well it could perform under unfavorable conditions. (See foldout, following.)

Operating under 70 pct of capacity for the third straight year, the industry absorbed two pay pay hikes, spent nearly $1.5 billion on capital equipment and earned more than 6 pct on its investment. All this without a price increase.

In 1961, the mills will again have to do it the hard way. Sales are not expected to top 1960 levels. Last year's labor boosts will be in effect a full 12 months. Prices show no signs of moving upward.

How Strong in '61? — Despite this outlook, many analysts have predicted the steel industry will equal or better 1960 earnings of nearly $767 million. This view assumes the industry will come close to last year's sales of $13.3 billion.

The first quarter was not encouraging for either sales or earnings. The mills operated under 55 pct of (1960) capacity. Few, if any, earned enough to cover dividends. One steel specialist now sees production down by 5 million tons from 1960 and earnings off by 15 pct. A top financial man says a profit dip is inevitable.

Financial Respect—It is too soon to say how well market or profit forecasts will stand up. However, it is clear the earning power of the industry has gained new respect in financial circles. It's true net income declined more than sales in 1960. The return on sales and on investment was smaller than in the preceding year.

Nevertheless, the 1960 showing was impressive. The industry started off with spending and operations geared to a record output of 125 million tons or more. By July, operations had been slashed to an annual rate of about 75 million tons or 50 pct of capacity.

There wasn't time to pull back capital programs. The mills wound up with the second highest spending year in history.

In 1960 the entire industry spent $500 million more than in 1959 and nearly $300 million more than the planned outlay for 1961.

Break Even Point—Effects of the market collapse must be considered in viewing steel earnings for '60, say financial men. One analyst feels the largest mills showed the ability to break even at about 40 pct of capacity. Between 55 pct and 60 pct, says the same source, the big mills could earn their dividends.

In 1961, the mills should be getting the full benefit of cost reduction programs. With the market expanding slowly, overhead costs are expected to rise more gradually than output. Some feel these factors will balance out higher employment costs.

Regardless of who is right, the profit return won't be enough to sustain current spending rates indefinitely. From 1946 to 1959, the steel industry spent $12.3 billion on capital equipment.

Analysts say a recession year should not be taken as a standard for spending. However, 1961 will be the fourth year in a row for steelmaking operations to register less than 70 pct of capacity. With strong pressure for modernization, the mills find themselves in what seems to be a sustained period of reduced demand, intense competition and slim profits.

1960 Steel Earnings – The Top Twelve

Net income of 12 steel companies rated in order of reported 1960 profits, with pct of change from 1959.

COMPANY	1960	1959	PCT CHANGE
U. S. Steel Corp.	$304,170,990	$254,563,401	+19.5
Bethlehem Steel Corp.	121,179,549	117,235,859	+ 3.4
Armco Steel Corp.	70,459,281	77,064,249	− 8.6
Republic Steel Corp.	52,846,373	53,890,116	− 1.9
Inland Steel Co.	47,050,611	48,354,030	− 2.7
National Steel Corp.	41,937,235	54,897,360	−23.6
Jones & Laughlin Steel Corp.	33,153,000	29,485,000	+12.4
Youngstown Sheet & Tube	25,719,166	30,956,040	−16.9
McLouth Steel Corp.	16,438,135	10,058,232	+63.4
Granite City Steel Co.	11,121,328	16,142,341	−31.1
Allegheny Ludlum Steel Corp.	8,750,209	11,290,664	−22.5
Wheeling Steel Corp.	8,277,364	7,033,050	+17.7

DATA COVER OPERATIONS OF 29 COMPANIES REPRESENTING 94 PCT OF THE INGOT CAPACITY OF THE UNITED STATES AS OF JAN

COMPANY	Year	Ingot Capacity Net Tons	Ingot Production Net Tons	Percent of Capacity Operated	Steel Shipments Net Tons	Net Sales and Operating Revenue	Depreciation, Depletion and Amortization	Provision for Federal Income Taxes[3]	Net Income[4]
U. S. Steel Corp.	1960	41,916,000	27,281,088	65.1%	18,698,242	$3,698,494,931	$208,424,291	$270,000,000	$304,170,990
	1959	41,916,000	24,445,353	58.3	18,093,747	3,643,040,035	189,854,452	233,000,000	254,563,401
Bethlehem Steel Corp.	1960	23,000,000	15,941,104	69.3	11,418,713	2,208,954,823	94,160,702	130,000,000	121,179,549
	1959	23,000,000	14,257,356	62.0	10,267,778	2,079,082,467	97,541,623	123,000,000	117,235,859
Republic Steel Corp.	1960	12,742,000	7,699,737	60.4	5,383,578	1,053,873,006	36,371,446	59,400,000	52,846,373
	1959	12,742,000	7,504,624	58.9	5,446,342	1,076,832,407	34,666,022	52,800,000	53,890,116
Jones & Laughlin Steel Corp.	1960	8,125,000	5,768,000	71.0	4,061,000	778,752,000	46,130,000	23,064,000	33,153,000
	1959	8,000,000	4,896,000	61.0	3,869,000	765,672,000	48,005,000	27,594,000	29,485,000
National Steel Corp.	1960	7,000,000	5,751,699	82.0	4,342,374	697,063,036	41,149,055	42,300,000	41,937,235
	1959	7,000,000	5,331,496	76.0	4,433,957	736,978,650	36,487,856	58,250,000	54,897,360
Armco Steel Corp.	1960	6,800,000	4,964,200	73.0	3,993,798	937,998,519	40,162,979	64,872,212	70,459,281
	1959	6,400,000	5,128,907	80.1	4,103,543	1,022,428,742	36,937,862	75,862,114	77,064,249
Youngstown Sheet & Tube Co.	1960	6,750,000	4,176,256	61.9	2,933,622	584,300,280	26,964,810	24,250,000	25,719,166
	1959	6,750,000	4,100,717	60.8	3,008,183	617,889,289	25,505,695	30,600,000	30,956,040
Inland Steel Co.	1960	6,500,000	5,111,825	78.6	3,712,097	755,721,239	41,010,000	44,250,000	47,050,611
	1959	6,500,000	4,227,317	65.0	3,162,272	713,215,002	35,208,330	39,150,000	48,354,030
Kaiser Steel Corp.[14]	1960	2,933,000	1,706,826	58.2	1,113,513	207,278,027	31,169,846	None	*8,215,842*
	1959	2,933,000	1,537,802	52.4	1,056,727	202,126,940	28,795,515	70,000	*7,401,070*
The Colorado Fuel & Iron Corp.	1960	2,709,875	1,592,978	58.78	1,174,984	249,108,729	12,526,946	*1,532,700*[8]	*4,802,729*
	1959	2,836,500	1,682,541	59.32	1,341,549	280,288,103	12,723,538	3,723,600	4,364,554
Wheeling Steel Corp.	1960	2,400,000	1,600,839	66.7	1,270,212	227,883,677	13,958,752	5,783,000	8,277,364
	1959	2,400,000	1,397,002	58.2	1,139,036	211,633,718	14,674,809	4,209,000	7,033,050
McLouth Steel Corp.	1960	2,040,000[5]	1,769,992	80.33[5]	1,344,029	216,628,693	9,443,774	17,800,000	16,438,135
	1959	2,040,000	1,215,693	59.59	966,967	177,446,839	14,105,539	5,600,000	10,058,232
Sharon Steel Corp.	1960	1,866,000	886,015	47.5	631,251	116,093,716	3,765,422	570,000	1,131,882
	1959	1,866,000	973,844	52.3	647,460	119,760,979	3,791,389	1,787,000	2,145,593
Pittsburgh Steel Co.	1960	1,620,000	1,006,867	62.2	798,667	143,865,008	8,648,919	1,132,000	1,026,475
	1959	1,560,000	935,411	60.0	794,061	150,647,405	8,074,608	*394,000*	*994,310*
Granite City Steel Co.	1960	1,440,000	1,143,193	79.4	960,071	137,328,462	6,326,792	11,978,000	11,121,328
	1959	1,440,000	1,307,970	90.8	1,126,328	164,371,219	6,556,861	17,230,000	16,142,341
Crucible Steel Co. of America	1960	1,433,180	766,173	53.5	569,538	210,965,000	8,370,000	*880,000*	1,240,000
	1959	1,431,180	886,726	62.0	579,488	219,229,000	9,223,000	4,900,000	6,106,000
Northwestern Steel & Wire Co.[16]	1960	1,152,000	629,775	54.7	467,243	67,258,342	2,433,445	7,010,000	5,873,265
	1959	825,000	638,203	77.4	538,009	83,781,108	2,321,004	9,200,000	8,450,321
Acme Steel Co.[17]	1960	1,060,000	629,036	57.19	694,686	140,875,562	4,776,938	2,187,000	2,208,125
	1959	1,059,760	401,542	36.50	644,761	134,156,206	3,582,549	3,308,400	3,616,481
Detroit Steel Corp.[9]	1960	1,000,000	638,649	64.0	557,612	89,446,690	4,467,579	4,370,000	3,638,720
	1959	900,000	824,757	92.0	719,811	117,886,109	4,465,788	11,896,000	13,174,715
Lukens Steel Co.	1960	930,000	592,216	63.7	417,237	103,152,067	3,767,850	4,192,000	4,948,175
	1959	930,000	568,244	61.1	377,624	83,178,393	3,377,804	2,770,000	2,598,496
Allegheny Ludlum Steel Corp.	1960	912,000	477,747	52.4	301,705	240,266,997	8,325,831	9,542,000	8,750,209
	1959	864,200	460,785	53.3	296,126	232,559,479	8,551,837	11,960,000	11,290,664
Phoenix Steel Corp.	1960	846,760	315,108	37.21	.....	37,781,532	2,021,060	*2,201,000*	*1,962,089*
	1959	846,760	556,031	65.67	.....	60,615,789	1,684,545	2,475,000	2,108,745
Alan Wood Steel Co.	1960	800,000	540,977	67.62	376,502	62,805,176	2,811,177	488,000	1,437,108
	1959	800,000	740,254	92.53	517,985	81,074,208	4,497,535	4,118,000	4,855,885
Lone Star Steel Co.[20]	1960	800,000	507,356	63.4	268,000	55,213,395	5,041,655	2,527,000	2,347,784
	1959	800,000	751,477	93.9	543,000	112,944,477	4,959,423	14,598,000	14,175,678
Copperweld Steel Co.	1960	660,000	.....	.....	.....	114,795,018	3,297,965	2,500,000	2,441,781
	1959	660,000	.....	.....	.....	138,364,827	3,032,350	6,336,000	5,972,457
Keystone Steel & Wire Co.	1960	600,000	422,148	70.36	307,124	63,550,197	1,872,272	5,351,185	5,359,338
	1959	600,000	502,271	83.71	400,137	82,838,545	1,654,005	9,256,741	8,911,383
Laclede Steel Co.	1960	600,000	496,588	82.76	395,035	70,248,910	1,684,318	4,210,000	3,906,089
	1959	600,000	600,384	100.06	482,867	87,671,707	1,467,012	6,400,000	5,632,652
Continental Steel Corp.	1960	420,000	368,802	87.8	254,386	46,420,427	1,475,046	4,975,000	4,328,427
	1959	420,000	388,365	92.5	311,340	57,083,835	1,388,381	6,275,000	5,647,052
Atlantic Steel Co.	1960	325,000	225,373	69.35	168,160	28,066,335	692,359	1,205,500	909,280
	1959	276,000	217,744	78.89	170,288	29,433,860	739,108	1,635,000	1,349,526
GRAND TOTAL	1960	139,380,815	93,300,000[1]	66.8[2]	66,900,000[1]	$13,344,189,794	$671,251,229	$730,283,197	$766,919,030
	1959	138,396,400	87,800,000[1]	63.3[2]	65,200,000[1]	$13,482,231,338	$643,873,440	$767,609,855	$791,684,494
Percent Change 1960 over 1959		+.7	+6.2	+5.5	+2.6	−1.0	+4.3	−4.9	−3.1

1. Estimate based on national operating rate.
2. National rate for industry by AISI.
3. Italics indicate tax credit.
4. Italics indicate loss.
5. McLouth ingot cap. 2,530,000 tons 9/1/60. Operating rate reflects increase.
6. Continental capital in excess of par $270,455.
7. C.F.&I. total loss includes loss of $3,606,104 on sale of Claymont. Net income before this was $1,196,625.
8. C.F.&I. federal income tax credit of $2,305,600 from loss on Claymont sale.
9. Detroit data includes accounts of Portsmouth Corp.
10. Before special items Detroit earnings were $4,585,615 in 1960 and $11,500,274 in 1959.
11. Detroit common stock reduced by 4854 shares sold on option in 1960.

ATES AS OF JANUARY 1, 1960

ion eral me s[3]	Net Income[4]	Net Income Percent of Sales[4]	Number of Common Shares Outstanding	Earnings Per Common Share[4]	Common Dividends Declared	Number of Preferred Shares Outstanding	Preferred Dividends Declared	Funded Debt	Preferred Stock	Common Stock
,000	$304,170,990	8.2%	54,033,307	$5.16	$162,016,191	3,602,811	$25,219,677	$422,778,670	$360,281,100	$900,555,117
,000	254,563,401	7.0	53,961,007	4.25	161,816,789	3,602,811	25,219,677	454,447,447	360,281,100	899,350,117
,000	121,179,549	5.5	45,487,528	2.52	109,156,147	933,887	6,537,209	140,411,000	93,388,700	555,950,145
,000	117,235,859	5.6	45,455,208	2.44	108,842,707	933,887	6,537,209	149,479,000	93,388,700	554,572,345
,000	52,846,373	5.0	15,708,454	3.36	47,113,309	None	None	214,728,451	None	157,189,161
,000	53,890,116	5.0	15,693,074	3.43	47,017,535	None	None	94,885,537	None	157,035,361
,000	33,153,000	4.3	7,852,283	4.04	19,626,000	293,568	1,468,000	133,181,000	29,357,000	78,033,000
,000	29,485,000	3.9	7,834,092	3.58	19,543,000	293,568	1,468,000	149,245,000	29,357,000	77,832,000
,000	41,937,235	6.02	7,582,460	5.53	22,680,299	.....	.....	189,513,555	.....	75,824,600
,000	54,897,360	7.45	7,538,643	7.28	22,522,643	.....	.....	191,308,555	.....	75,386,430
,212	70,459,281	7.5	14,797,013	4.76	44,387,150	.....	.....	158,850,000	.....	147,970,126
,114	77,064,249	7.5	14,795,516	5.21	44,377,417	.....	.....	174,599,000	.....	147,955,157
,000	25,719,166	4.5	3,485,017	7.38	17,419,235	.....	.....	165,329,221	.....	113,077,143
,000	30,956,040	5.1	3,477,905	8.90	17,356,414	.....	.....	115,110,518	.....	112,586,010
,000	47,050,611	6.3	17,576,986	2.68	28,065,998	None	None	209,265,000	None	121,960,478
,000	48,354,030	6.9	17,444,272	2.77[12]	26,699,542	None	None	215,427,700	None	117,170,361
ne	*8,215,842*	*4.0*	3,282,866	*3.49*	None	1,623,529	3,251,229[1]	269,554,137	55,588,225	3,282,866
,000	*7,401,076*	*3.7*	3,279,123	*3.26*	1,307,057	1,661,263	3,300,113[1]	232,577,116	56,531,575	3,279,123
,700	*4,802,729*[7]	*1.93*	3,892,630	*1.34*	Stock—4%	148,326	428,012	75,306,700	7,416,415	19,380,477
,600	4,364,554	1.56	3,739,967	1.04	Stock—8%	159,219	463,661	78,318,700	7,965,925	18,617,161
,000	8,277,364	3.63	2,107,330	3.14	6,311,947	329,087	1,666,855	29,284,200	32,908,700	21,073,300
,000	7,033,050	3.32	2,095,528	2.53	4,976,908	342,975	1,724,416	31,118,600	34,297,500	20,955,280
,000	16,438,135	7.59	3,485,404	4.51	None	230,876	705,785	60,342,000	1,153,150	8,713,510
,000	10,058,232	5.67	1,722,877	5.32	None	306,865	899,362	67,420,000	11,543,800	4,307,192
,000	1,131,882	.97	1,106,267	1.02	940,007	None	None	9,000,000	None	11,123,060
,000	2,145,593	1.79	1,104,649	1.94	1,104,069	None	None	10,400,000	None	11,106,880
,000	1,026,475	.72	1,586,595	*.18*	.....	241,943	1,308,148	28,257,940	24,194,300	15,865,950
,000	*994,310*	*.66*	1,586,595	*1.45*	.....	241,943	1,308,148	29,603,370	24,194,300	15,865,950
,000	11,121,328	8.1	4,286,885	2.59	5,997,791	3,162	24,901	36,581,287	316,200	26,793,031
,000	16,142,341	9.8	4,274,923[15]	3.76[15]	4,483,180	7,307	52,242	36,758,581	730,700	26,718,268
,000	1,240,000	.6	3,831,997	.19	3,065,598	99,882	524,380	33,061,000	9,988,200	47,669,000
,000	6,106,000	2.8	3,865,631	1.50	3,092,505	99,885	293,662	20,589,000	9,988,500	48,320,000
,000	5,873,265	8.7	2,502,113	2.35	2,502,113	None	None	5,400,000	.....	12,510,565
,000	8,450,321	10.1	2,502,113	3.38	2,251,902	None	None	6,000,000	.....	12,510,565
,000	2,208,125	1.57	2,801,256	.60	2,778,112	115,000	485,937	34,000,000	11,500,000	28,012,560
,400	3,616,481	2.70	2,797,310	1.17	3,183,047	72,500	351,439	28,000,000	7,250,000	27,973,100
,000	3,638,720[10]	4.1	3,921,753[11]	.90	3,479,712[12]	None	92,500	18,000,000	None	3,921,753
,000	13,174,715[10]	11.3	3,916,899	3.33	2,565,082[12]	15,000	135,880	20,000,000	1,500,000	3,890,586
,000	4,948,175	4.8	953,928	5.19	1,430,892	None	None	18,824,000	None	3,179,760
,000	2,598,496[18]	3.1	953,928	2.72[18]	953,928	None	None	26,517,095	None	3,179,760
,000	8,750,209	3.64	3,883,470	2.25	7,759,590	None	None	42,209,600	None	3,883,470
,000	11,290,664	4.85	3,869,654	2.92	7,729,553	None	None	44,036,600	None	3,869,654
,000	*1,962,089*	*5.19*	1,083,817	*1.81*	None	None	None	18,412,946	None	4,335,268
,000	2,108,745	3.48	1,036,887	2.03	5% in Stock	None	None	8,324,260	None	4,354,736
,000	1,437,108	2.29	696,007	1.72	1,113,611	48,398	241,990	15,000,000	4,839,800	6,960,070
,000	4,855,885	5.99	696,007	6.63	974,410	48,398	241,990	.....	4,839,800	6,960,070
,000	2,347,784	4.0	3,923,788	.60	Stock—10%	None	None	30,402,538	None	3,923,788
,000	14,175,678	13.0	3,923,788	3.61	Stock—10%	None	None	37,000,000	None	3,567,080
,000	2,441,781	2.1	1,176,312	2.08	2,352,125	None	None	18,493,184	None	5,881,560
,000	5,972,457	4.3	1,175,447	5.00	2,258,121	None	91,005	18,630,168	None	5,877,235
,185	5,359,338	8.43	1,875,000	2.86	3,750,000	None	None	None	None	2,604,167
,741	8,911,383	10.76	1,875,000	4.75	3,750,000	None	None	None	None	2,604,167
,000	3,906,089	5.56	206,250	18.94	1,650,000	None	None	5,400,000	None	4,125,000
,000	5,632,652	6.42	206,250	27.31	1,650,000	None	None	3,600,000	None	4,125,000
,000	4,328,427	9.32	1,032,802	4.19	2,504,544	None	None	1,400,000	None	7,229,614[6]
,000	5,647,052	9.91	516,401	10.95	2,323,804	None	None	1,600,000	None	7,229,614[6]
,500	909,280	3.2	396,500	2.18	475,800	6,571	45,997	3,550,000	700,000	2,000,000
,000	1,349,526	4.6	396,500	3.29	237,900	6,571	45,997	4,050,000	700,000	2,000,000
,197	$766,919,030	5.7	224,556,018	$3.42	$496,576,171	7,677,040	$42,000,620	$2,386,536,429	$631,631,790	$2,393,028,539
,855	$791,684,494	5.9	211,735,194	$3.74	$491,017,513	7,792,192	$42,132,801	$2,249,046,247	$642,568,900	$2,379,199,202
.9	−3.1	−3.4	+6.1	−8.6	+1.1	−1.5	−.3	+6.1	−1.7	+5.8

nts of Portsmouth

earnings were $4,-
74 in 1959.

d by 4854 shares

12. Prior to acquisition Portsmouth Corp. declared dividends of $775,292 in 1960 and $620,234 in 1959.
13. Inland earnings per share in 1959 include special credit of $3,288,870 or 19¢ a share.
14. Kaiser data reflect 200,000 shares 5¼% convertible preference stock, par value $100 a share.
15. Granite City common stock adjusted for 2-for-1 split 1/22/60.
16. Northwestern data on fiscal year ending July 31.
17. Acme data includes Acme-Newport Steel Co.
18. Lukens income does not include special credit of

$1,590,34
justments
19. Alleghen
give effe
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20. Lone St
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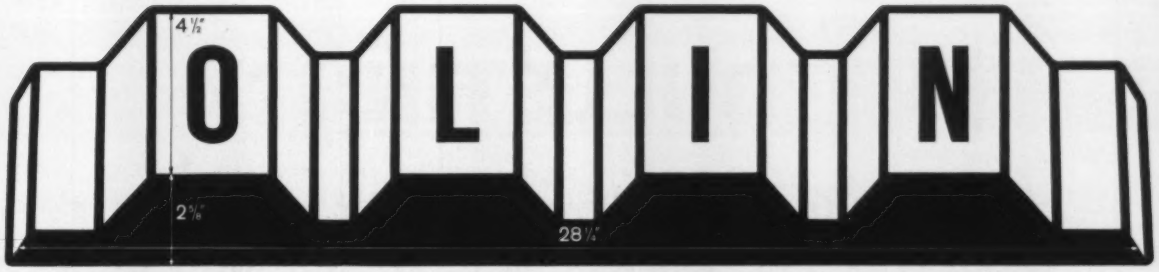
THE IRON AGE STEEL INDUSTRY FINANCIAL ANALYSIS 1960-1959

	Surplus	Invested Capital	Working Capital	Net Income Percent of Investment[4]	Year	COMPANY
7	$2,041,031,287	$3,724,646,174	$608,094,605	8.6%	1960	U. S. Steel Corp.
7	1,924,096,165	3,638,174,829	615,538,386	7.5	1959	
3	999,840,101	1,789,589,946	656,905,687	7.0	1960	Bethlehem Steel Corp.
5	994,353,908	1,791,793,953	725,133,178	6.8	1959	
1	571,069,894	942,987,506	282,432,252	6.2	1960	Republic Steel Corp.
1	564,964,658	816,885,556	235,174,285	7.1	1959	
0	430,086,000	670,657,000	134,024,000	5.8	1960	Jones & Laughlin Steel Corp.
0	417,532,000	673,966,000	167,311,000	5.2	1959	
0	436,866,542	702,112,267	158,952,569	6.0	1960	National Steel Corp.
0	415,588,995	682,182,129	241,597,605	8.8	1959	
6	548,657,111	855,477,237	434,240,712	9.0	1960	Armco Steel Corp.
7	522,533,000	845,087,157	387,334,798	9.8	1959	
3	352,321,555	630,727,919	187,726,801	5.1	1960	Youngstown Sheet & Tube Co.
0	343,576,513	571,273,041	200,883,165	6.2	1959	
8	364,084,719	695,310,197	145,783,719	8.06	1960	Inland Steel Co.
1	345,100,106	677,698,167	157,187,795	8.80	1959	
6	80,697,753	409,122,981	63,349,914	.8	1960	Kaiser Steel Corp.[14]
3	92,050,613	384,438,427	22,865,709	1.2	1959	
7	116,495,188	218,598,780	83,980,969	.20	1960	The Colorado Fuel & Iron Corp.
1	122,420,901	227,322,687	89,499,216	3.58	1959	
0	102,606,439	236,321,036	86,938,689	3.95	1960	Wheeling Steel Corp.
0	102,307,877	238,567,941	86,055,023	3.48	1959	
0	86,413,160	156,621,820	41,228,817	11.69	1960	McLouth Steel Corp.
2	76,712,915	159,983,907	41,305,189	7.57	1959	
0	66,445,464	86,568,524	35,889,462	1.79	1960	Sharon Steel Corp.
0	69,296,208	90,803,088	38,802,242	2.87	1959	
0	46,385,826	114,704,016	27,737,344	2.26	1960	Pittsburgh Steel Co.
0	46,667,499	116,331,119	28,355,423	.49	1959	
1	75,311,090	139,001,608	27,324,101	9.3	1960	Granite City Steel Co.
8	70,104,050	134,311,599	37,051,123	13.3	1959	
0	72,352,000	163,070,000	57,558,000	1.5	1960	Crucible Steel Co. of America
0	74,688,000	153,585,000	61,604,000	4.5	1959	
5	29,018,587	46,929,152	17,511,379	13.1	1960	Northwestern Steel & Wire Co.[16]
5	25,647,435	44,158,000	15,571,995	19.9	1959	
0	41,354,377	114,866,937	32,499,314	3.27	1960	Acme Steel Co.[17]
0	42,425,719	105,648,819	38,833,631	4.70	1959	
3	69,583,513	91,505,266	31,280,496	5.1	1960	Detroit Steel Corp.[9]
6	70,210,395	95,600,981	36,992,006	15.0	1959	
0	46,849,185	68,852,945	22,886,309	9.0	1960	Lukens Steel Co.
0	43,331,902	73,028,757	24,609,403	4.7	1959	
0	106,603,436	152,696,506	69,747,688	6.87[19]	1960	Allegheny Ludlum Steel Corp.
4	105,303,887	153,210,141	77,698,897	8.38[19]	1959	
8	17,823,901	40,716,741	19,275,995	.....	1960	Phoenix Steel Corp.
6	20,250,714	32,929,710	21,287,396	8.18	1959	
0	25,623,862	52,423,732	7,346,816	3.91	1960	Alan Wood Steel Co.
0	25,529,855	37,329,725	7,004,206	13.01	1959	
8	63,108,047	97,434,373	44,131,257	4.20	1960	Lone Star Steel Co.[20]
0	61,116,971	101,684,051	46,555,927	16.39	1959	
0	41,922,930	66,297,674	25,787,848	5.11	1960	Copperweld Steel Co.
5	41,819,960	66,327,363	30,249,255	9.84	1959	
7	45,461,075	48,065,242	4,079,615	11.10	1960	Keystone Steel & Wire Co.
7	43,851,737	46,455,904	3,510,471	19.18	1959	
0	30,451,494	39,976,494	18,862,616	10.32	1960	Laclede Steel Co.
0	28,195,405	35,920,405	17,207,983	16.19	1959	
4[6]	23,427,114	32,327,183	17,968,205	13.6	1960	Continental Steel Corp.
4[6]	21,603,231	30,703,300	16,572,936	18.7	1959	
0	8,189,866	14,345,311	6,073,170	6.3	1960	Atlantic Steel Co.
0	7,802,383	13,957,828	5,974,629	9.7	1959	
9	$6,940,081,516	$12,401,954,567	$3,349,618,349	6.2	1960	GRAND TOTAL
2	$6,719,083,002	$12,039,359,584	$3,477,766,872	6.6	1959	
	+3.3	+3.0	−3.7	−6.1		Percent Change 1960 over 1959

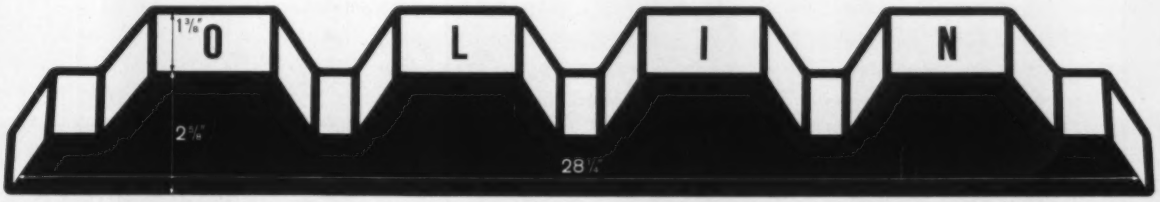
,347 ($1.67 a share) for prior year ad-
nts.
eny Ludlum percent of investment does not
ffect to income taxes on bond interest and
e.
Star common shares adjusted for stock
nds.

STEEL INDUSTRY FINANCIAL ANALYSIS

50-lb. ingot



25-lb. ingot



10-lb. ingot

Casting? Call Olin.

All Olin Aluminum distributors carry a wide range of casting alloys in immediately available stock from the 10-lb. ingot to the exclusive 25-lb. ingot and the 50-lb. ingot. Olin Aluminum sales offices and distributors also offer you a full range of technical service backed by Olin's metallurgical staff and laboratories. This service includes help in metal selection and application advice, tips on casting and finishing aluminum. Why not make Olin Aluminum your source of primary casting alloys—and the latest metallurgical know-how. Call your local Olin Aluminum distributor or nearby sales office and get experienced help on any of your foundry problems.

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ALUMINUM®
400 PARK AVE., NEW YORK 22, NEW YORK

Ordinary hydraulic fluid made from mineral oil is ignited by open flame. Torch is 18 inches from nozzle orifice.

Shell Irus 902 Hydraulic Fluid, in the same test, refused to be ignited by 3000-degree flame.

BULLETIN:

3000-degree flame does not ignite Shell Irus 902—the fire-snuffing hydraulic fluid that helps make factories safe from fire

Shell forced Irus® 902 Hydraulic Fluid through a .145-inch orifice at 1000 psi pressure. The Irus Fluid was sprayed from the orifice and a 3000-degree flame thrust into the streaming fluid. Irus was not ignited.

Read the advantages of economical Shell Irus 902 and how it can protect your plant.

IRUS 902 is the fire-snuffing hydraulic fluid that protects lives and equipment.

How Irus works

Irus 902 is an ingenious combination of oil and water. The water is encased in a film of oil. In technical terms, it is a 100% water-in-oil emulsion.

But unlike other emulsions, Irus 902 has optimum stability. This is vitally important. It means that Irus Fluid will retain its lubricating qualities far longer than unstable oils—and will not allow the water to separate out. Result: the water stays in the oil, ready to snuff a fire if needed.

Other advantages

1. Cools off systems. Because of its high rate of heat transfer and high heat capacity, Irus 902 can allow hydraulic systems to run cooler.

2. Resists thickening and thinning. The viscosity of Irus 902 is tailored to protect pump parts during the entire working cycle—from cold start-up to hot, continuous operation.

3. Saves gaskets, packing, hose. Irus 902 is gentle to nonmetallic parts as well as metal. It can be used almost anywhere that you'd use mineral oil.

4. Resists foaming. Irus 902 does not hold captive air. If air is introduced, Irus 902 quickly releases it.

5. Easier to spot leaks. Irus 902 is bright yellow, helps you spot leaks quickly.

For complete details about changing over to Shell Irus 902, contact your nearest Shell Industrial Products Representative. Or write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y.

A message to manufacturers of hydraulic equipment

Shell Irus 902 makes an excellent initial fill.

1. It is available anywhere in the U.S.A.

2. Quality of Irus Fluid is consistently high. It must meet strict Shell specifications.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry.

Not to Spend May Be Costly

You can always make a case for economy in business. But, more and more, you can show that it will cost more not to spend for needed equipment.

It's a decision that is doubly hard to make in a low business cycle, when the pressures on cost are strongest.

■ Never have so many facts and figures been available for management decision-making. This can be a good thing if they are properly used—which means they must be checked against experience and balanced off by common sense.

Earlier this year we witnessed a remarkable semantic feat: Two groups of people, one labeled "Democrat," the other "Republican," looked at the same figures and came up with opposite conclusions.

Figuritis may get by in politics but it is dangerous in business.

A Case in Point—Take the company that runs a battery of 30-year-old melting furnaces. A dozen men swarm over them, keeping them running and getting out "x" tons of metal a month. A smart sales engineer drops in and shows the plant superintendent that one man can run two of his new-type units and get out the same tonnage.

The proposal is duly made and the board of directors okays it; with these and some other new equipment a price cut in the end-product is in the cards. Or more profit.

Delay, Delay—What happens? In this, as in many similar cases of which we have personal knowledge, the decision to go ahead was put off until October (We'll see what things look like then). In October it was deferred until January; in January until April.

So, as the economy turns the corner, these companies will not be fully equipped for profitable operation; they'll be squeezed by competition from imports and other materials. These "defer" decisions ran into the hundreds last year.

Recovery Affected — They delayed recovery. Why were they made? We suspect that in many cases they were due to too much "fun with figures"—too much attention to national statistics and not enough to the common-sense approach to one's own particular problems.

There is a growing tendency to rely on bankers and accountants more than on operating men. We have no quarrel with bankers (Some of our best friends are bankers). But someone has to decide whether a manufacturing company is going to be run as a financial institution or as a manufacturing operation.

Leadership Needed — In some cases, this will take statesmanship by the bigger companies. Compared to the flow of hundreds of forward-looking decisions by business, government-pump priming is piddling.

Why not dig out of those shelved projects and take another hard look in terms of your own situation on modernization? To paraphrase a machine tool builder's slogan, "If you need more efficient equipment you are paying for it right now."

. . . Fun With Figures

■ The man from Washington says that a certain proposal for spending $1 billion will not "of and by itself" contribute to a deficit. This is semantics; this is "fun with figures."

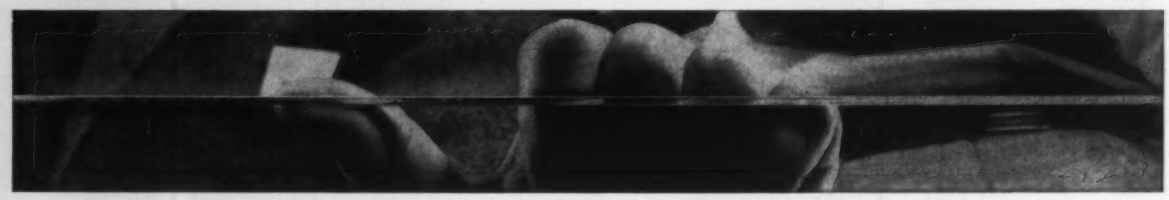
The man who makes $500 a month and buys four $100 suits has not by this single purchase put himself into bankruptcy. But if this is his way of living, he's headed for trouble.

Dollars Stretch—"Fun with figures" can be overdone in the opposite direction too. If you have 10 salesmen with an average cost per sales call of $20 and you get each one to make one more call a day, you don't add $1000 a week to your sales cost. You add the cost of a few gallons of gasoline, plus taxes.

If it costs $4.50 for an executive to dictate a letter, as the accountants tell us, this doesn't mean that your expenses are going up if each of your executives puts out, say, four more letters a day.

And if a piece of new equipment costs $50,000 but will pay for itself in four years—or keep you in a line you might lose in a year if you don't re-equip—you are not giving away $50,000, you are putting it to work for you.

Sees $4500 annual screw saving



RB&W fastener survey uncovers use of special item which is replaceable by standard hex screw at much less cost

Of course you pay more for a "special" than a "standard" item—and that includes fasteners. So, when surveying a company's usage of fasteners, the RB&W Man looks sharply for the "specials"—and a valid reason for their use.

He could find no good purpose for the extensive use of screws with heavy head and milled body in one particular product. There was neither a specification requiring close fit in very close tolerance holes . . . nor were there exceptionally "sloppy" holes that called for an oversize head to span.

He therefore recommended assembly with standard RB&W High Strength Hex Screws. They would meet any physical requirement for the "special" being used... *but cost 30¢ less per unit.* Yearly total: $4500 more for *profits* instead of *costs.*

Are you *sure* you're not needlessly wasting dollars on fastener specifications? Let the RB&W fastener expert survey them. He's made proper fastener usage a science, is ready to cooperate with your engineers. Contact Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

RB&W

116th year

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco. Sales agents at: Cleveland, Milwaukee; New Orleans; Denver; Fargo. Distributors from coast to coast.

Congress Probes Auto Safety

The government is proposing Federal standards on safety features of vehicles. Automakers protest such a proposal.

They say it would be "unnecessary and impractical." Also, Detroit says, it is impossible.
By A. E. Fleming

■ Automakers have suggested that the Federal government keep its engineers away from Detroit design labs.

The move came in response to a Federal proposal to impose standards on safety features of vehicles sold, shipped or used in interstate commerce. In Washington last week, representatives of the Automobile Manufacturers Assn. termed the bill "unnecessary and impractical."

Automakers say there are two reasons why Federal design standards won't work. First, they say, safety features are "basically and intimately" involved with other design and performance features. They can't be set apart, according to the auto industry.

Impossible — Secondly, the variety of autos made make standardization impossible.

In essence, automakers point out that such items as safety padding, shock absorbing equipment, lights, brakes, and tires are part of the complete structure of the car. Item-by-item standardization is therefore out of the question.

As for speed governors and horsepower limitations, they are not safety factors, says Detroit. Excessive speed prevention, they claim, is a matter of driver control through enforcement and education.

Performance or Design?—Auto men point out that the basic concept of engineering today is performance rather than design. These standards can't be written before engineering practices are developed, they note. Attempts to prescribe a design by writing a standard aren't practical.

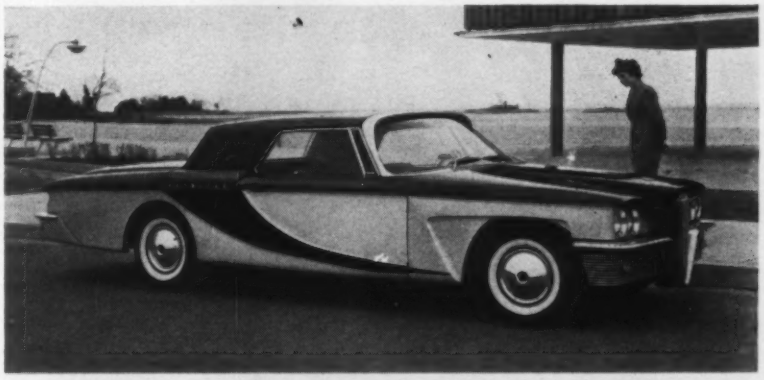
They also claim that duplication of present standards would result from a government attempt to write workable auto standards.

New Research Cars Highlight Aluminum

Olin Mathieson Chemical Corp. is displaying three "Scimitar" autos for the first time in the U. S. this week. The cars are being shown at the International Automobile Show in New York.

The autos, tagged as "research cars," include a two-door hardtop convertible, a station-sedan model, and a town-car hardtop. All three utilize aluminum to a major extent as a body material. They have anodized aluminum quarter panels. Grilles, bumpers, trim, wheel discs and many interior components are brushed and anodized aluminum.

OM says the cars are part of a research program to develop new functional and decorative uses of aluminum. The autos were built two years ago and have been exhibited briefly in Europe.



RESEARCH VEHICLES: Olin Mathieson Chemical Corp. is showing its "Scimitar" convertible (with hard-top up and down) in New York this week. The car is being used in research to develop new aluminum uses.

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Hyster 2,000 and 2,500 lb. cushion tire lift trucks—industry's newest and finest.

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Electronics Moves to the Top

Aircraft Will No Longer Be Top Employer, Study Shows

Before the year is over, the electronics industry will be the top employer in S. California.

A bank survey shows aircraft dropping to second place.
By R. R. Kay

■ The aircraft industry, number one in southern California for many years, is about to take second spot.

There's a new star on the horizon—electronics. Before the year is over, this industry will be the top manufacturing employer in the region. Over 145,000 persons will be working for makers of electronics, electrical machinery, equipment and supplies.

That's the gist of a thorough study by the Research Dept. of Security-First National Bank, Los Angeles.

Employment Leap—In the past three years, total employment in the area rose by some 156,000 persons. And this while the top manufacturing employer, aircraft, was taking a beating. It dropped 81,000 from the payrolls.

Such huge shifts in workers in so few years is tough on them, and on the companies, too. But the bank points to these beneficial changes:

Other Jobs—1. Most of the displaced workers found other jobs.

2. All major aircraft companies have a big stake in the fast-moving missile - electronics - space research programs.

3. Much of the drop in aircraft output is now behind. The decline didn't hit at once. It stretched out over three and a half years.

4. Manufacturing employment, other than aircraft, climbed to all-time highs.

5. Los Angeles now depends less on a single industry.

One fact, however, doesn't change: The area still leans more heavily on the defense dollar than the nation's other large metropolitan centers.

Fabricating Work On Coast Resumed

Bethlehem Steel's Pacific Coast Div. is going back into its fabricating end of the reinforcing bar business in South San Francisco.

A new plant will cost one-half million dollars. It should be operating next month.

Bethlehem will shape, cut, and ship material to specifications. Its steel mill will feed the straight lengths of material to the new facility for fabrication. This shop will be able to handle some 2500 tons per month.

Contour Cable Slims Missile Waistlines

THINGS TO COME: Hughes Aircraft Co. has developed flowing spirals of contour cable to replace bulky round wiring in missiles. Flat metal strips in plastic ribbon will weigh half as much as conventional cable.

Gown by Fon Tayne reflected in stainless by Crucible Steel Company of America

Stainless by

CRUCIBLE

where a fine finish is only the beginning

Builder Backs Trade With Reds

Tool Builders Are Told Trade, Not Aid, Is Needed

E. M. Hicks, NMTBA president, says U. S. can't stop Russia from increasing capacity by not selling them machine tools.

He says more competition from foreign tool makers is due when their own markets slow. By R. H. Eshelman

■ Trade, not aid, is the need of the machine tool industry if it is to remain healthy. This is what Everett M. Hicks, president of National Machine Tool Builders Association, told the machine tool distributors at their spring convention in San Francisco.

Mr. Hicks struck out against recent restrictions of machine tool exports to Russia and other Iron Curtain countries. He warned that the machine tool industry today badly needs greater sales volume if it is to maintain its position of world leadership.

During a trip to Russia in January this year, Mr. Hicks said, he was informed that the Soviets are making large quantities of machine tools themselves, and have surplus quantities of some types. Nevertheless, they still need to purchase other kinds.

More Trade Needed — "Of course," he adds, "it can be argued that any machine tool will add to the economic potential of the Iron Curtain countries. However, I think it would be a good thing if there were more trade between the Soviet Bloc and the West. Only through increased contacts can relationships be improved."

He continued, "I certainly do not think the United States is going to stop Russia from increasing its automotive capacity simply by deciding that we do not wish to sell our machine tools to them." He points out that if the Russians want to copy they should have little trouble. Most of our production machines have been sold to countries all over the world.

"The only real security," he warns, "lies in our continued improvement through research and development programs. This will help us maintain the 'machine tool gap' " (our technological lead).

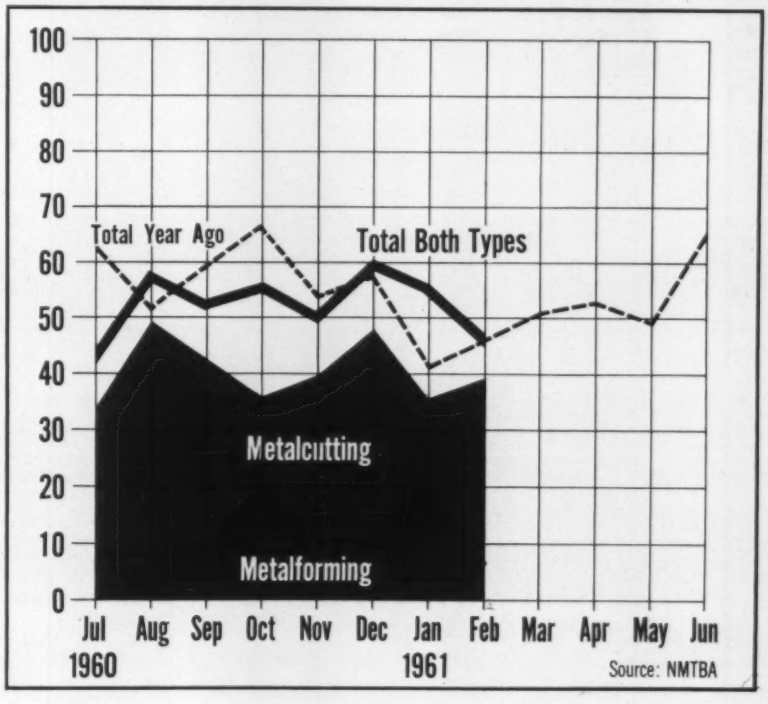
Stymies—Mr. Hicks also hit monopolistic labor practices and the restrictive tax situation. He says these have stymied economic growth in metalworking and have prevented machine tool sales from recovering from the recession of 1958.

In noting the unsatisfactory trend of domestic machine orders, he contrasted the marked prosperity of Western Europe and large backlogs of European builders. He forecasts increased competition in the American market from these countries when their business slows down a bit.

Although this country has adopted a philosophy of increased world trade, he asserts, wage and price spirals are forcing American business out of export markets. These spirals also invite lower-cost imports into the U. S.

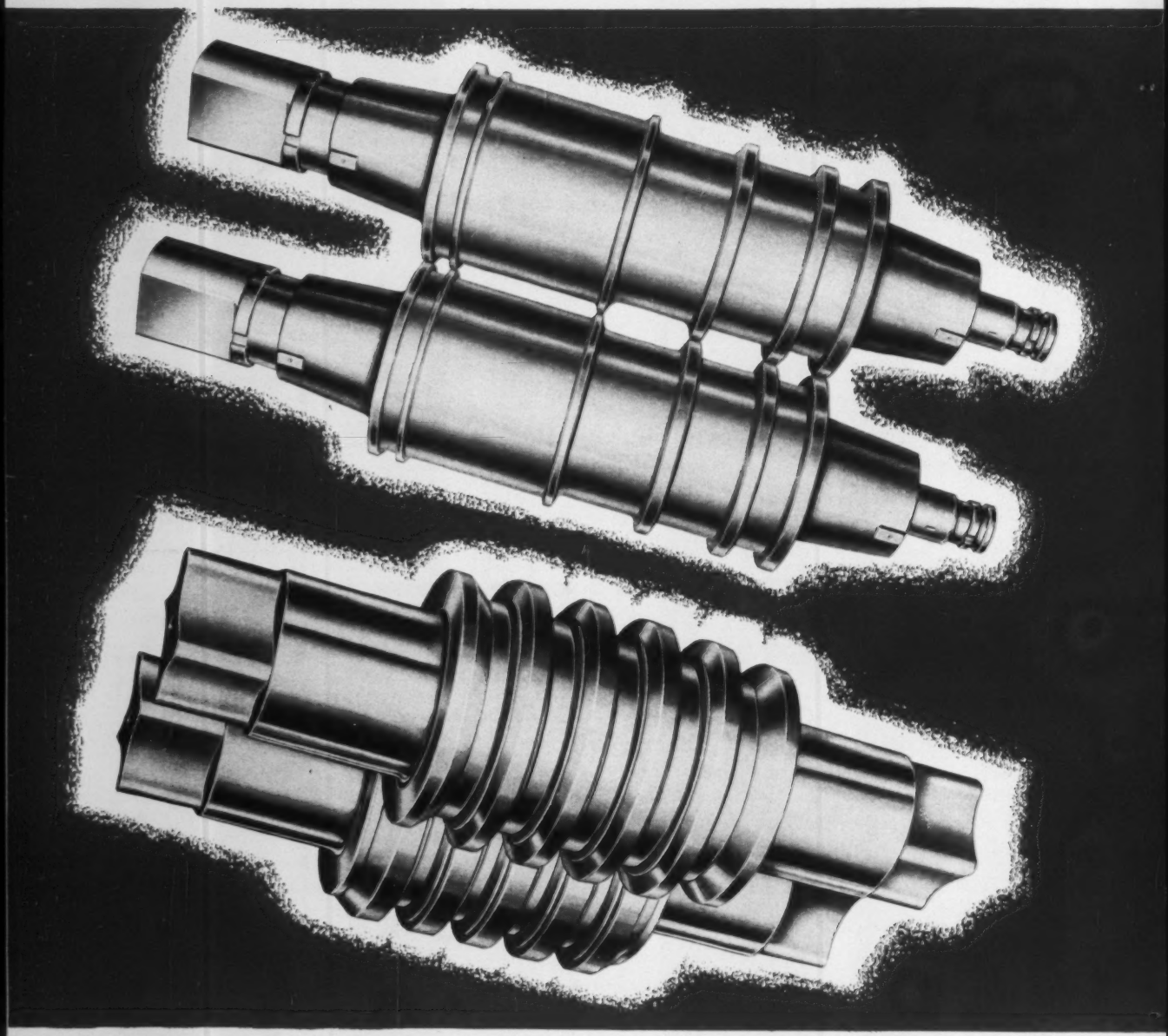
MACHINE TOOLS–NET NEW ORDERS

In Millions of Dollars — Metal Cutting and Forming Types



Ohio Rolls

Shaping Metal for all Industry



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Ohioloy Rolls	Double-Pour Rolls	Nickel Grain Rolls
Ohioloy "K" Rolls	Chilled Iron Rolls	Special Iron Rolls
Nioloy Rolls	Forged Steel Rolls	

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OR-48

T. A. Bedford, elected president and director, Henry J. Kaiser Co. (Canada) Ltd.

Ford Motor Co.—**R. J. Hampson,** appointed general manager, Ford Tractor Operations.

Fairchild Engine and Airplane Corp. — **Maurice Center,** named general manager, Fairchild Astrionics Div., Wyandanch, Long Island.

Fairbanks, Morse & Co.—**W. M. Gates,** appointed manager, St. Johnsbury (Vt.) Works.

Fostoria Corp.—**W. E. Helfrich,** appointed sales promotion manager, Electric Products Div.

Gabriel Co. — **J. N. Cossitt,** named sales manager, Valve Div.

Grove Valve and Regulator Co. —**A. H. Stephens,** appointed Southern California district manager for sales of valves and regulators.

Hupp Corp. — **D. N. Gredys,** named general manager, Perfection Div.

Leland Ohio Electric Co.—**J. E. Grahm,** appointed general manager.

Radiant Lamp Corp. — **H. A. Erickson,** appointed sales manager.

Springfield Boiler Co. — **E. L. Weaver,** named manager, contracts.

Allis-Chalmers Mfg. Co.—**W. T. Havron,** appointed manager, industrial sales, New Orleans district; **H. C. Blair,** named manager, Phoenix district; **C. E. Temple,** appointed works purchasing agent.

Alan Wood Steel Co.—**G. J. Van Fossen,** appointed superintendent; **J. L. O'Hara,** appointed asst. superintendent.

Capewell Mfg. Co. — **Stuart Polito,** appointed sales engineer, Pittsburgh area.

Dravo Corp.—**P. J. Berg,** appointed manager, sales and development, Engineering and Construction Dept., Machinery Div.

J. H. Mangle, elected vice president, operations, Oliver Corp.

Brown & Sharpe Mfg. Co. — **Edward Kibbitt,** appointed supervisor, subsidiary operations; **H. A. Szostek,** appointed district manager, eastern sales district; **F. E. Montie,** appointed factory manager, Greystone plant; **T. R. Hall,** appointed plant superintendent, Greystone plant.

Minneapolis-Honeywell Regulator Co.—**S. D. Harper,** appointed manager; **C. H. Smith,** appointed general manager, Ordnance Div., Duarte, Calif.

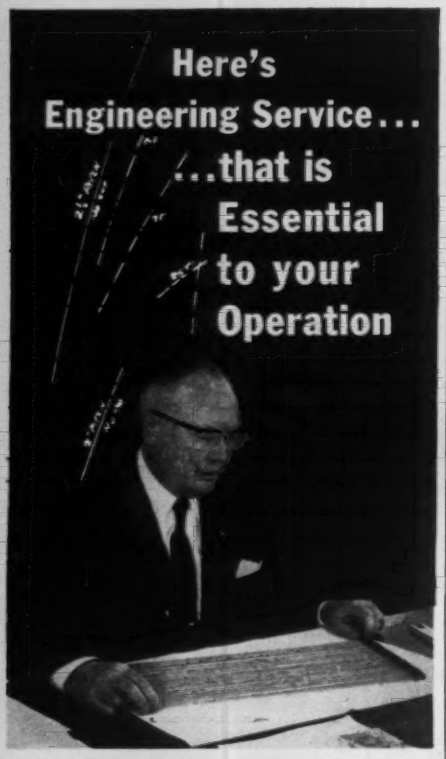
Erie Strayer Co.—**W. J. Jenkins,** named sales manager.

(Continued on P. 94)

H. G. Lewis, elected president, American Institute of Steel Construction.

V. B. Benfer, appointed general manager, General Ultrasonics Div., Acoustica Associates, Inc.

W. C. McKee, appointed controller, Crucible Steel Co. of America.



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ROLLER CHAINS, SPROCKETS, CONVEYOR CHAINS, FLEXIBLE COUPLINGS, ATTACHMENTS. (Special and Standard)

(Continued from P. 93)

D. J. Coughlin, appointed general sales manager, Brewer-Titchener Corp.

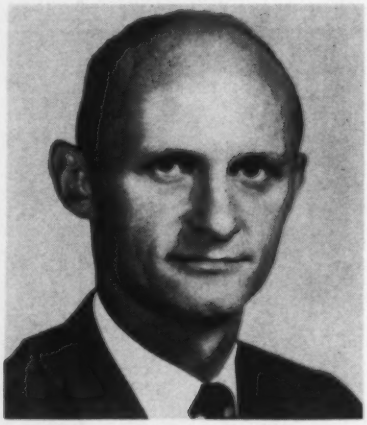
Allis-Chalmers Mfg. Co.—**C. W. Haromn,** appointed supervisor, production control, planning and scheduling dept., York Works; **H. C. Blair,** appointed manager, Phoenix district, Industries Group; **R. R. Walker,** manager, defense materiel dept.; **Ray Bell,** manager, defense systems dept.

Hoover Ball and Bearing Co.—**R. B. Parker,** named director, materials; **G. A. Grahm,** appointed production control manager.

Fairbanks, Morse & Co.—**J. P. Henebry,** appointed director, Water Div.

Eutectic Welding Alloys Corp.—**H. E. Doyle,** named regional manager, North Central States.

J. L. Woodley, elected vice president, Hyster Co.



Glenn Herz, elected vice president, Hyster Co.

Olin Mathieson Chemical Corp. —**J. J. Frost,** appointed asst. product manager, Metals Div.

Plume & Atwood Mfg. Co. — **C. L. Hudak,** named general sales manager.

H. W. Wright, appointed asst. vice president, corporate relations, Armco Steel Corp.

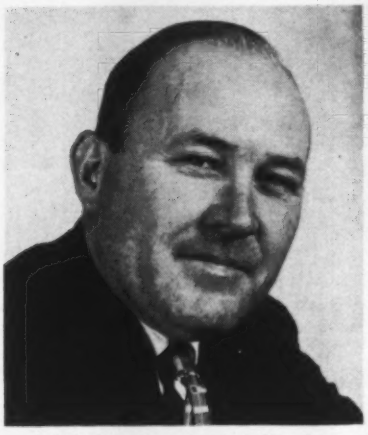
J. I. Case Co.—**C. F. Grumley,** named corporate director, purchasing and traffic.

Modernair Corp.—**W. J. Baum,** appointed asst. sales manager; **Karl Brandenberg,** appointed chief engineer.

Robinson Pneumatic Conveyor Div., Morse Boulger, Inc.—**H. W. Bonneau,** appointed sales manager.

Master Builders Co. — **M. R. Woodward,** appointed regional field sales manager, East Central Div.

I. E. Rhoden, appointed director, physical research laboratory, Link-Belt Co., Indianapolis.



J. W. Gunstream, appointed asst. plant manager, U. S. Steel's Gary plant.

Erie Strayer Co.—**W. J. Jenkins,** named sales manager, Bucket Div.

Data Recorders Div., Consolidated Electrodynamics Corp.—**R. A. Hall,** appointed director, connector operations.

Beckman Instruments, Inc.—**R. A. Lineberger,** appointed asst. controller.

Alitalia — **Rinaldo Baietti,** appointed Detroit district sales manager.

Borden Chemical Co. — **F. I. Belmont,** appointed manager, export dept.

Industrial Div. of Nopco Chemical Co.—**S. E. Manilych,** appointed sales manager, Metal Processing Dept.

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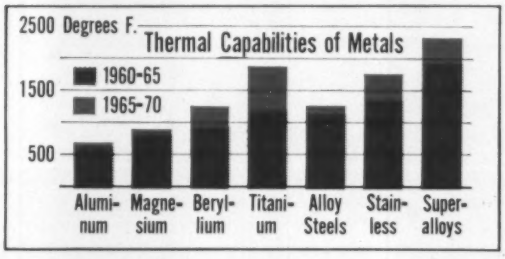
Launchings vs. Business

How much business will space projects generate in the future? This question is now being tossed around in Washington. The answers seem fantastic. But the same could have been said of automobile predictions in 1910. The latest gage is a guess at the number of spacecraft launchings of the future. One Washington space expert predicts that launchings will go as follows: By 1965, 500-1000; by 1970, 2000-5000; by 1975, 5000-50,000.

Can Metals Take the Heat?

Higher thermal capabilities are a must if the materials roadblock is to be broken. According to the Aerospace Industries Association, requirements for future aerospace designs include: Lower densities with higher temperature resistance; better fabrication traits; more complete structural design data. The AIA forecast indicates sharp gains in thermal capabilities for titanium and beryllium in the next ten years.



FORECAST: Thermal capabilities to improve.

Gas Turbine to Fill Gap

Aimed at filling an across-the-board need for both military and industry is a new 600-hp gas turbine. Among the target characteristics for the engine are: Life cycle on a par with standard reciprocating engines; low maintenance; fuel consumption of 0.4 lb/hp-hr; competitive cost.

"Pressure Cooker" Forming

Recently installed at a Convair plant, a giant autoclave is processing phenolic-laminated production and tooling parts. The new "pressure cooker" provides up to 300 psi as compared with 14 psi with earlier equipment. "Because of the high pressures available, we can now shape strong, high-density laminates on intricate forms with a precision not previously possible," explains J. R. Evans, tooling foreman.

Aircraft Go Stainless

New military aircraft are using more stainless than ever before. The Bristol T-188 is the latest example. Its keel boom is forged and machined from a single 39-ft length of Type 403 stainless barstock. Type 403 stainless is also used for skin sections and engine-nacelle parts. Rivets, bolts, fastener collars and all hydraulic tubing in the new supersonic craft are also made of stainless steels such as Types 321 and 420.

Change in Space Program?

New moves are being made in Washington to reorganize the space program. Military men are suggesting the Pentagon take over the civilian space agency NASA. They say "commercial aspects" of space must be "subordinated to the military." NASA officials point out, however, that it's still official U. S. policy to keep military hands off the exploration of space for peace.

Roving Shows Strength

Design engineers in the aircraft industry are focusing more attention on glass-fiber reinforced plastics as a structural material. In Germany, flanges of rotor-wing blades in helicopters are attached with loops of impregnated rovings. The rovings pass from the blade edge to the flange and back to the edge endlessly.

Fabricate in Space

Next step after manned spaceflight is manned, orbiting space stations, say many experts. This will call for fabricating of large structures in near-space orbit and require use of new metalworking techniques. Explosive forming and welding are two methods under study. Emphasis will also focus on other fabricating methods that use minimum equipment and weight.

WHICH WAY?

There are many ways to weld, but you want the one that *best* fits your needs. Your choice is determined by metals, thicknesses, designs, joints...and your fabricating objectives—economy, quality, speed, strength, appearance, precision. Which welding process should you use? Tig? Mig? CO_2? Spot welding? Manual, semi-, or fully-automatic? Would a cutting process simplify production? Correct answers to these questions require experience with the major arc welding and cutting processes—from submerged arc to plasma arc—introduced during the past 25 years. LINDE has *all* of these processes. No other company does. In fact, LINDE *introduced* almost all of them...and *improved* the rest. Consequently, LINDE has far more experience with tungsten-arc cutting, inert-gas welding, and continuously-fed electrode welding than any other company in the world. In many cases, these processes are ideal. In some, they are even a necessity. Because we have all of them, we recommend only the one that *best* fits your needs. When making your choice, bear in mind that a recommendation from an equipment manufacturer is apt to be *only as accurate as the completeness of his line.*

LINDE COMPANY

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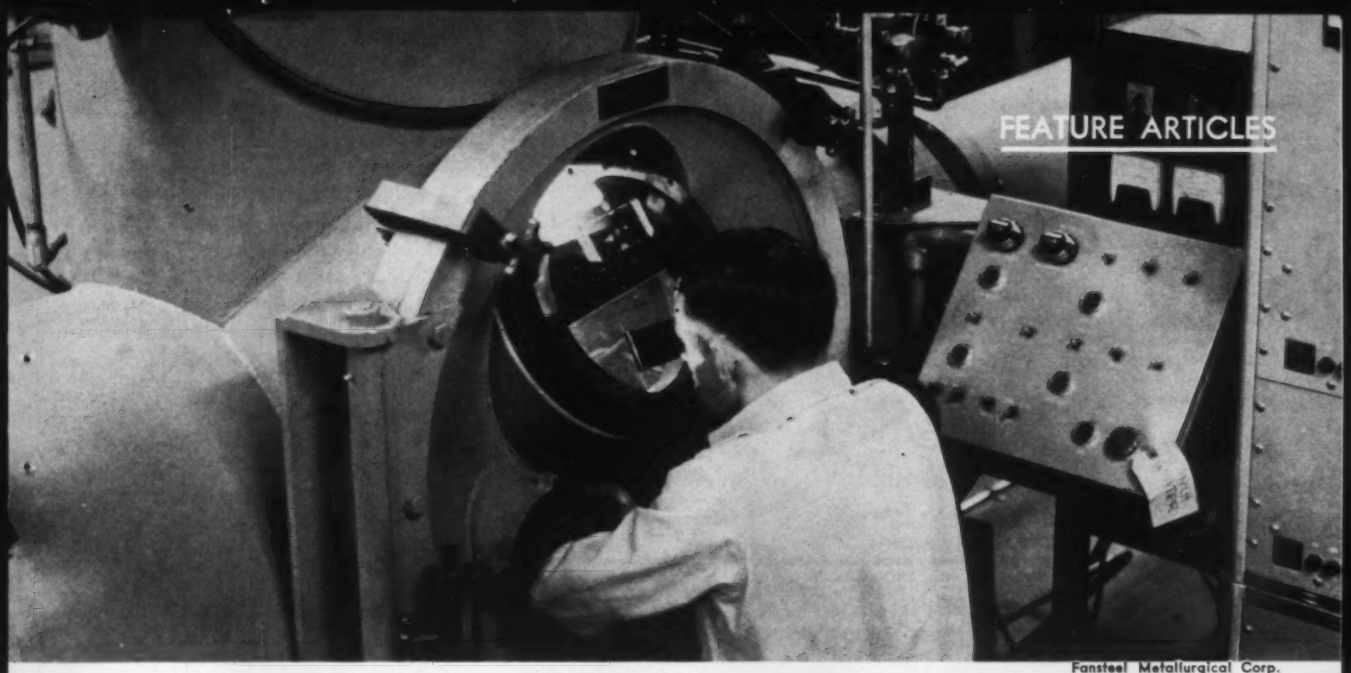


Fansteel Metallurgical Corp.

MANUAL POSITIONING: Port holes in inert-gas chamber permit operator to manipulate weldments.

Welding Meets Challenge Of Space Age Metals

Some reactive metals are welded more easily than others, but all can be welded.

Air can be poison to these welds. The trick is to prevent such contaminants from entering at the very beginning.

By **R. R. Irving**
Welding Editor

■ The space age metal has little tolerance for contaminants. In welding, the main ones to watch are oxygen, nitrogen and carbon.

Take titanium, for example. It can stand no more than 0.2 pct oxygen during welding. Of course, the presence of other contaminants reduces this level further. But molybdenum and tungsten have even lower limits than titanium.

If these limits are exceeded, you can count on severe embrittlement. Despite this drawback, titanium is being welded in many plants throughout the world 24 hours a day.

Key to this welding riddle can be summed up in one word: purity. The purer the base metal and the purer the welding environment, the greater are your chances of success.

Not all reactive metals are as easy to weld as titanium. The very brittle nature of tungsten, for example, presents an even bigger challenge to welding engineers. There's a material with a melting point of about 6170°F. Nevertheless, it is being welded.

Important Jobs—At present, most of these metals find their way into such vital jobs as national defense and atomic energy. Whether the end use is a heat shield in a space vehicle or an element in a nuclear reactor, the pressure is on. Better welds are needed.

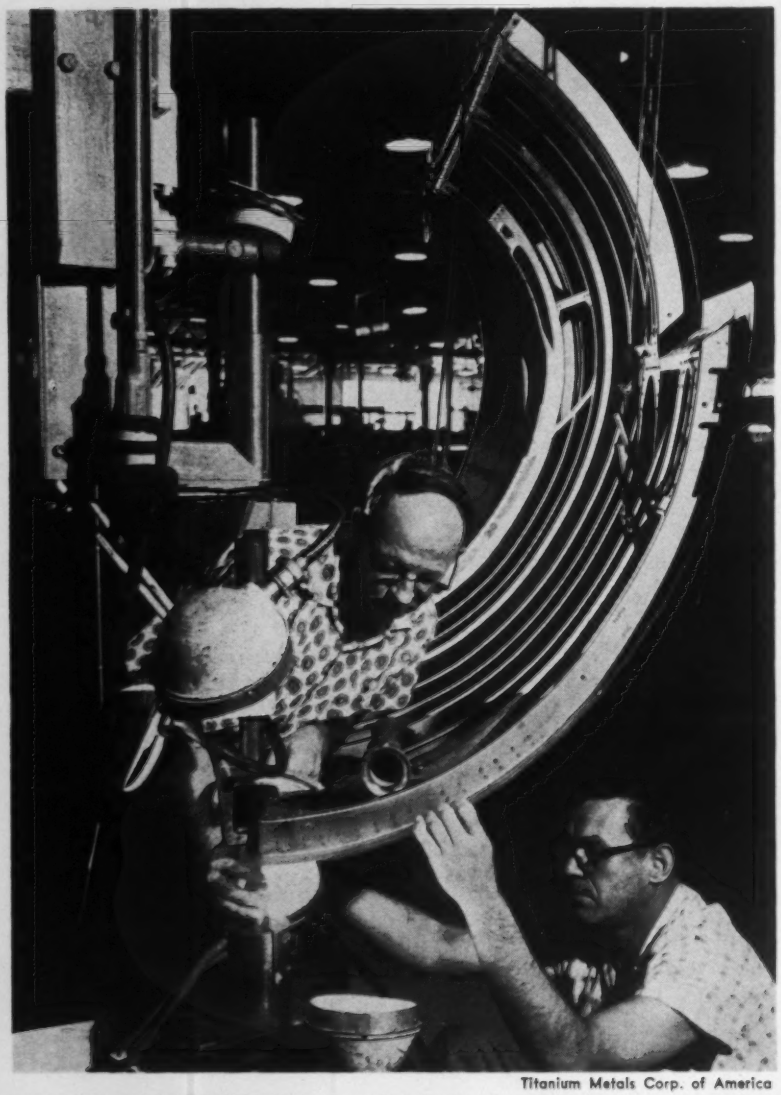
Here, there are two schools of

WELDING SHOW HIGHLIGHTS

The annual Welding Show will be held this year in New York. The time and place for important events can be found on Page 138. A complete rundown of the technical sessions begins on the same page. Turn to Page 142 for an up-to-date list of exhibitors.

Rundown of Reactive Metals

Metal	Melting point, °F	Density, g per cc
Tungsten	6170	19.3
Tantalum	5425	16.6
Molybdenum	4730	10.22
Columbium	4474	8.57
Zirconium	3366	6.49
Titanium	3300	4.54
Beryllium	2332	1.85



Titanium Metals Corp. of America

AIRCRAFT STRUCTURE: A special jig developed by Ryan Aeronautical Co. is a great asset in spotwelding skins to supporting ribs.

thought. One school claims that a certain alloy should be developed to handle a specific job. If you can't weld it with present-day techniques, then improve the available ones or invent new methods. Meanwhile, a great deal of time and money is spent. Sometimes, the alloy in question turns out to be unweldable.

A more logical solution to this pressing problem concerns alloy design. Why not build weldability into the material in the first place? There might be some compromise in doing so, but at least the alloy will be weldable.

When it comes to ease of weldability, titanium heads the list. It's no longer just a "security" metal. It is starting to make in-roads into the chemical industry in the form of piping. The marine industry and salt-water conversion plants have great hopes for it. These interests are spurred on with the knowledge that titanium can be welded.

Special Status — Zirconium and its alloys enjoy a special place in our economy. They are used almost exclusively in the nuclear industry. It's interesting to note that zirconium can be welded just as easily as titanium. If that's the case, why so much talk about "the problems of welding" the metal?

Ductile welds in zirconium can be obtained with little effort. But the Atomic Energy Commission wants more than ductility. The surfaces of the metal must be untinted. As a result, you can make this comparison: In welding, zirconium is to tool room tolerances as titanium is to production line tolerances. For zirconium, the AEC probably enforces the strictest codes in the welding industry.

You must bear in mind that welding research into many of these metals is still at a very early stage. Much of the success in welding reactive metals can be traced right back to previous successes in welding titanium. The earth's fourth most plentiful metal has served as a sort of "guinea pig" for the rest of the group.

Many research labs throughout the country are constantly striving to improve the weldability of other reactive metals. Particular success has been noted with tantalum and columbium. Molybdenum is perhaps a tougher nut to crack, but it's possible to weld. Tungsten, of course, presents problems. Even here, though, the picture looks promising.

Beryllium Solved? — Due to its brittle behavior and toxicity, beryllium has been hard to weld. The Brush Beryllium Co., however, reports satisfactory Tig welds in its own lab using a collapsible bag for shielding. Beryllium, welded by the electron beam, shows great promise.

The cost of many of these metals is high, to be sure. In time, however, research and development often have their way with prices. The cost of some exotic alloys has already reached the eye level of private enterprise.

All reactive metals display similar traits during welding. Suppose you've reached that point in production when it's time to weld the jet-engine subassembly. A mistake at this stage could mean the ruin of a $40,000 investment.

All it will take is just a pinch of contamination. Some metals are more sensitive than others to the harmful effects of oxygen and nitrogen. Fortunately, the science of welding is eager and ready to fight this battle. There are many ways to prevent these elements from destroying costly weldments.

Approaches — Granted, a pure environment for welding is a must. That being the case, you have two choices. You can either place the structure inside a vacuum or you can blanket the weldment with high-purity inert gas.

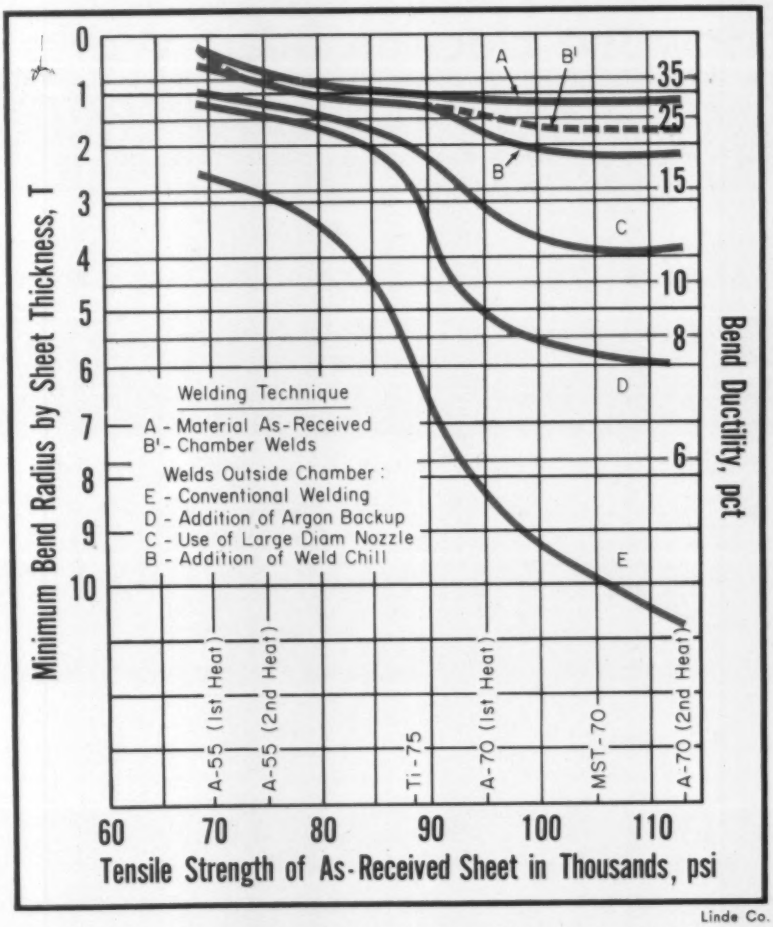
Help is constantly on the way from metals producers. Naturally, they want to sell their alloys on a repeat basis. They know what you can and can't do with reactive metals. They can also be a big help in suiting the most weldable alloy to the ideal welding process.

Experience is plentiful, too.

Fansteel Metallurgical Corp.

REFRACTORY METALS: Longitudinal welding setup is designed to weld tubular sections of tantalum and columbium up to 40 in. in diameter.

Purity Insures Sound Welds



Linde Co.

CONTROLLED PURITY PAYS: Titanium alloys (going from right to left) become progressively purer. By introducing purer controls to the welding cycle, sounder, more ductile welds can be produced.

among the builders of welding equipment and machines. These companies keep tabs on field activities. Your present problem may have been solved once before by another fabricator.

Melting Point — The refractory metals (W, Ta, Mo and Cb) not only have high densities but very high melting points. A lot of heat is needed to weld any of them. They all react to air at higher temperatures. With the exception of tantalum, they all undergo a ductile-to-brittle transition.

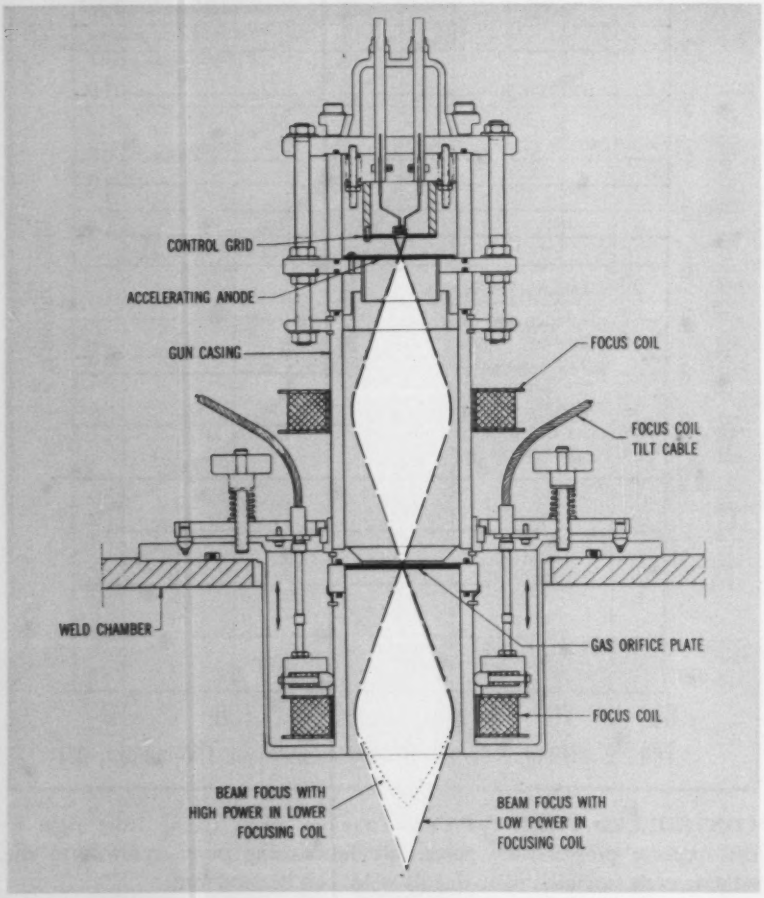
To weld any of the reactive group, experience is the best teacher. Conditions will vary from one job to the next. Sometimes the difference will only be a matter of slight degree. It's best to make sure that each condition is met properly before welding. Material cost is high. Be certain you do the job right.

Sciaky Bros. Inc.

INTERIOR VIEW: Steel vacuum chamber with stainless cladding for electron beam welding contains the electron gun and worktable.

How the Electron Beam Works

Air Reduction Sales Co.



Choice of Two — Two welding processes are widely used to join these metals. One is the more conventional inert-gas method. The other is the highly exotic electron beam technique. Each process has its pronounced advantages.

Inert-gas welding can either be carried out with a consumable filler metal (Mig welding) or with a nonconsumable tungsten electrode (Tig welding). On reactive metals, most welding is done by the Tig method, although Mig welding is used on heavier sections of the more weldable alloys.

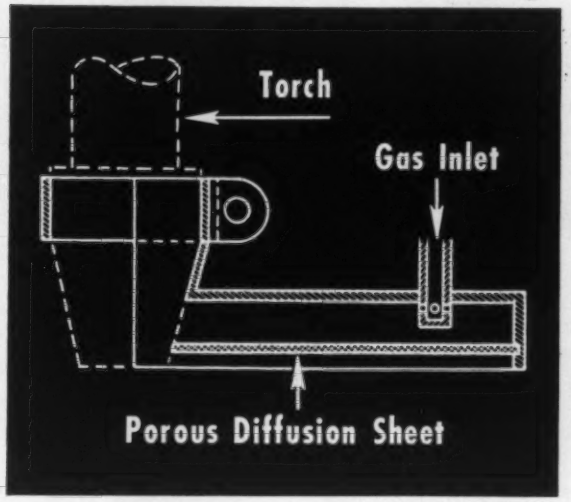
Argon or helium (or even a mixture of the two) is the shielding gas. Conventional Tig welding torches are available from many sources. So are power supplies. Isn't this the same array of equipment you need to weld stainless or aluminum? Yes, it is.

Chamber Needed—The big difference is that you might need a chamber to weld in. This type of equipment can get expensive. There are times when you can weld outside the chamber, but not when the job is critical.

Electron beam machines can be divided into two types: low-voltage and high-voltage systems. Many manufacturers have already thrown their hats in the ring as builders of low-voltage systems. At present, they seem to be more popular throughout industry.

How Low?—When you speak of low-voltage equipment, you're talk-

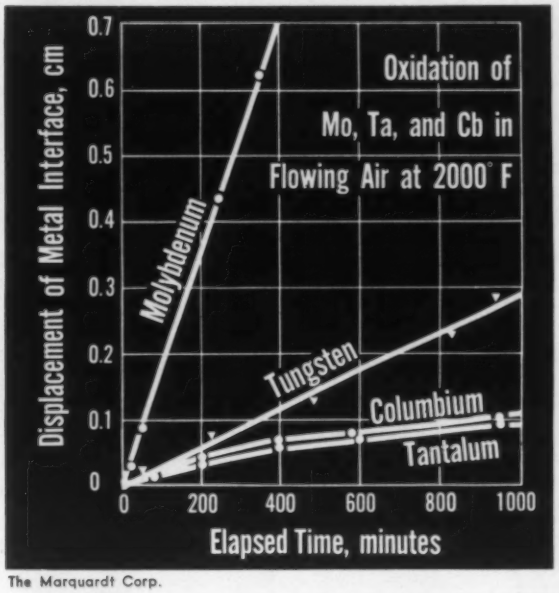
Use Shield for Hand Welding



Battelle Memorial Institute

TRAILING SHIELD: In manual welding, the trailing shield blankets the postweld zone with inert gas.

Where Some Metals Oxidize



The Marquardt Corp.

ing about machines that operate no higher than 50,000 v. The high-voltage system operates at about 100,000 v.

Ultrasonic welding is being put through its paces with the exotic alloys. So are the various resistance welding techniques. Spot-welding of titanium, for example, finds common use in the aircraft industry. But most of the work is carried out with Tig and electron beam methods.

You can either weld in a chamber or out in the open with inert gas. In the electron beam technique, you must weld in a chamber. Regardless of which process you use, the chamber puts restrictions on your welding. If the weldment won't fit into the chamber, you'll have to either build a bigger chamber or see if open-air Tig welding won't do the job.

King Size—Chambers as big as 24 ft in length have been built, but such size is an exception to the rule. Electron beam welding is said to be faster than Tig welding in a chamber.

P. J. Rieppel of Battelle Memorial Institute, Columbus, notes that much wider use of the process for its deep-penetration traits would result if the workpiece could be kept outside a chamber.

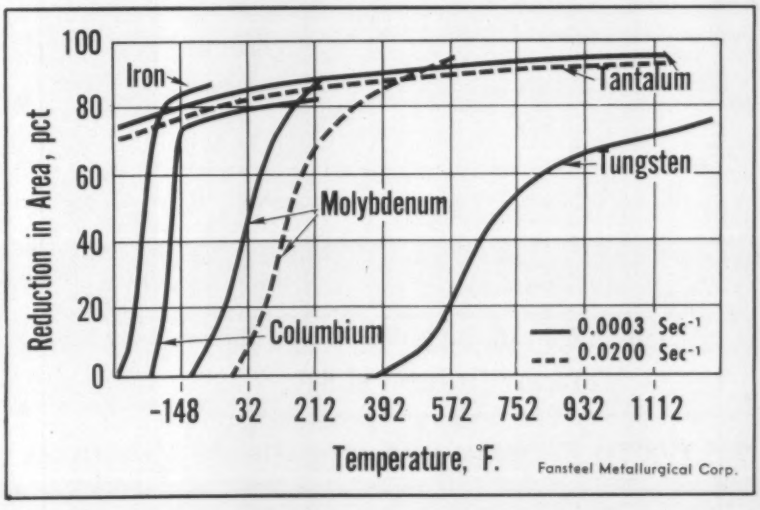
"Although this appears contrary to the basic principles of the process," Mr. Rieppel adds, "electron beam equipment reportedly is used to drill holes in jewels that are not in the vacuum chamber."

Spotwelding by arc has already proved itself in production. One such setup was used to make 472 welds in the control-fin assembly of the Terrier missile. The material was a titanium alloy. Using filler metal, this process will weld parts with poor fitup.

Role of Ultrasonics—Ultrasonic welding is under test for all these metals. Most of this work is spot-welding of very thin sections. Ultrasonics is also being used to refine the grain structure of welds made by some other process during solidification.

Most of the work done today is

Note Transition Temperatures



Fansteel Metallurgical Corp.

by Tig welding. When you use this process, you can select one of four shielding means. You can weld inside a metal chamber, complete with viewing port. You can weld inside a Plexiglass chamber. Another choice is the collapsible bag. Still another choice is the use of large nozzles and a trailing shield for open-air welding.

In or Out?—Should you weld inside or outside a chamber? According to E. F. Gorman, development engineer at Linde Development Laboratories, Newark, N. J., the chamber doesn't guarantee success.

He adds: "There's often less contamination outside a chamber than inside. Outside, you have a fresh stream of high-purity gas. Inside, however, stagnant atmospheres are often used. They become more and more contaminated due to outgassing of heated materials.

"Under proper conditions of use," continues Mr. Gorman, "the atmospheres for both in- and out-of chamber welding can approach the purity limit of the shielding gas itself."

Breakthrough — Welding out in the open should get a boost from a new but very inexpensive development. It's a simple collet assembly for use in certain Tig welding torches. The new device offers two advantages. It provides better shielding and will permit the welder to move his torch into more of the hard-to-get-at areas.

Production work, where fairly simple shapes are required, are naturals for the Tig process.

From the users' standpoint, the question of whether to use argon or helium is still a matter of debate. The choice usually boils down to personal taste. A person experienced with a particular gas will swear by it. Often, however, mixtures of the two gases are used.

Chamber welds made with the tungsten arc are also moving ahead. There's a trend toward automation. Success seems to be better if the operation is remotely controlled. The mere presence of gloves inside a chamber can introduce enough contamination to wreck a highly critical job.

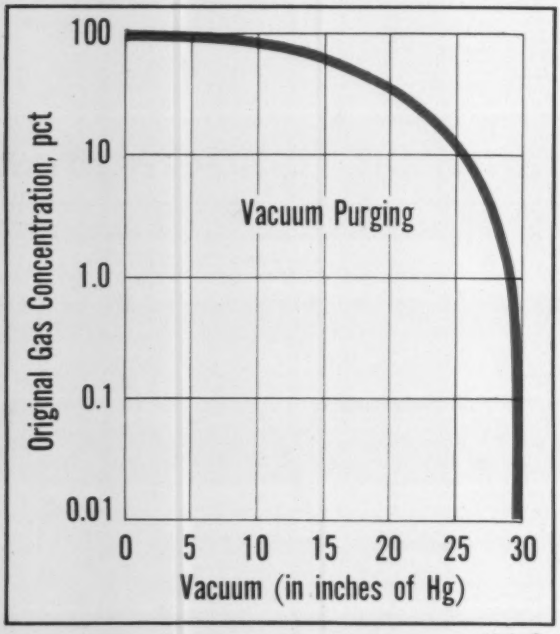
Before You Buy—Electron beam welding is a horse of another color. Is there enough work to justify its high initial cost? If there isn't you'll have to convince management that the equipment can perform other duties as well. It could be melting or zone refining or any of the many other jobs that the electron beam does so well.

D. C. Buffam, Chief of the Metals Joining Branch of Watertown Arsenal Laboratories, Watertown, Mass., puts it this way: "For us to purchase an electron beam machine, we must please a multitude of people."

The high-voltage systems have always held the upper hand when it comes down to penetration. But builders of low-voltage units are constantly adding greater depth in the performance of their machines.

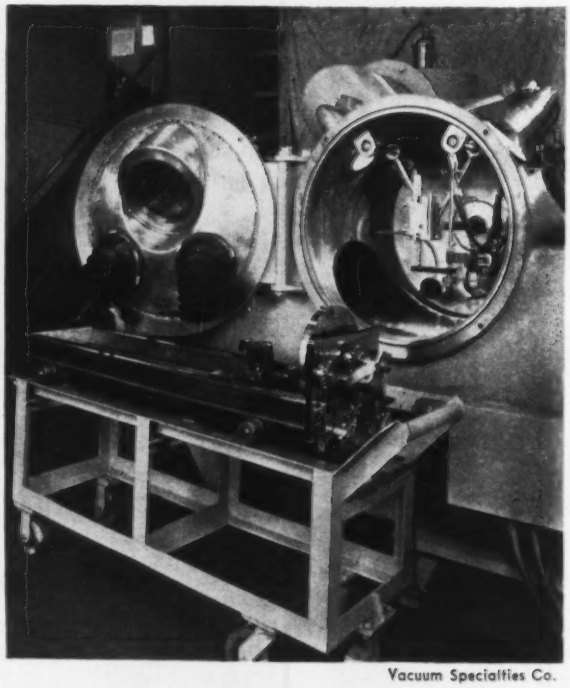
Clear Thinking?—G. W. Carr, an official of Vacuum Specialties Co., Somerville, Mass., feels that industry is making a great mistake as far as pumping systems are concerned. Just because the Navy has established 0.03 micron as a purge pressure in the Tig welding of Zircaloy is no reason for industry to follow suit in its thinking.

Vacuum Purging the Chamber



Linde Co.

FOR PURITY: Residual air approaches a 0.01 pct level only when a near-ultimate vacuum is reached.



Vacuum Specialties Co.

INERT-GAS SETUP: Equipment for Tig welding in a chamber can be adapted to suit a range of operations.

"To get to that level," says Mr. Carr, "you have to use an expensive fusion pump. For far less money, you can use a mechanical pump which will get down to a pressure region of 15-20 microns. You can do a lot of welding in this pressure range. This overall factor is hard on commercial development."

Some Are Difficult—How do the various reactive metals respond to welding methods? Titanium, of course, can be welded by many methods. Problems are much more severe with beryllium and tungsten. All of them, however, must be approached with caution.

You can save yourself a lot of grief if you prepare three things in advance. First, be certain that the surfaces to be welded are extremely clean. Also, establish the proper environment. The third factor is one that is often overlooked. Design suitable fixturing.

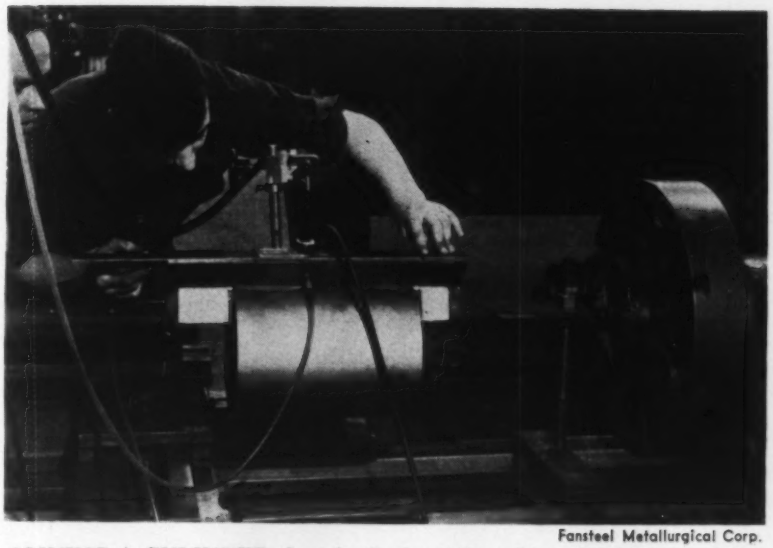
In regard to the last point, W. P. Hatch, Jr., Chief of the Welding Development Section, Watertown Arsenal, has this to say: "Most welding problems today can be traced to poor fixturing. This problem becomes even more acute with the growth of automation."

Ductile Welds—The four members of the refractory group tend to pair off into two weldable camps. Tantalum and columbium are very ductile at room temperature. Tungsten and molybdenum are not. With either group, however, you must keep your eye on melting point and the susceptibility of the metal to oxidize.

In Tig welding any of these metals, the degree of weld ductility is important. The higher the degree, the more reason to move the welding operation inside a chamber.

Careful design of jigs and fixtures can position the parts any way you want them inside a chamber. Where the fixture is the sole means of alignment, you'll have to use internal expanders, external clamps and hold-down fingers.

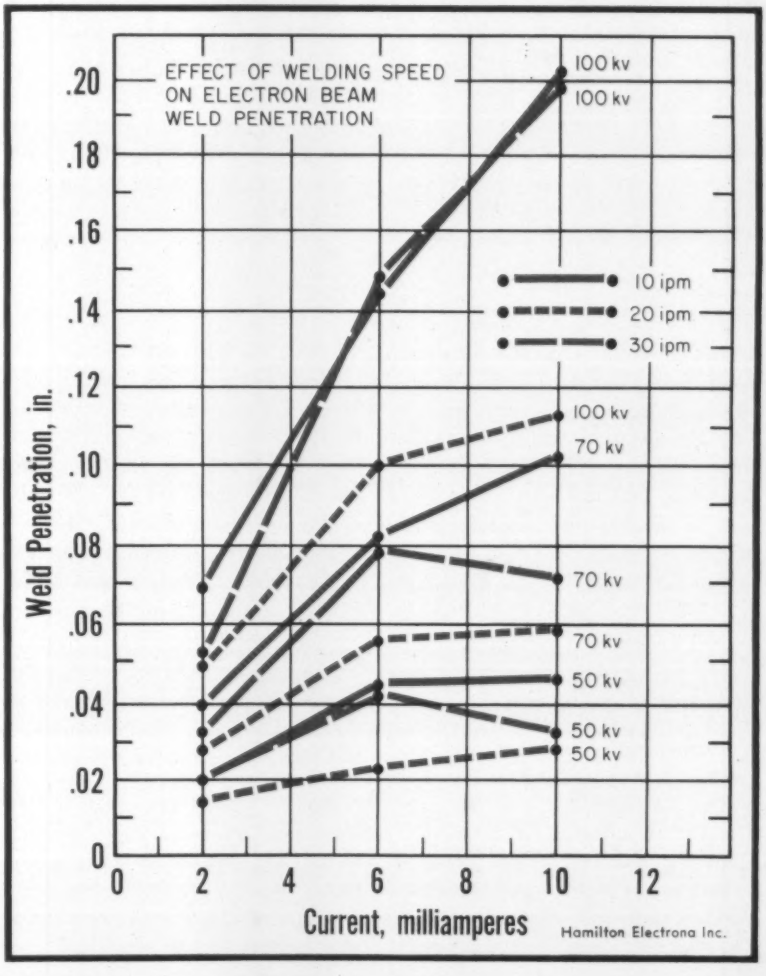
Room for the Gas—Leave enough room for the inert gas to flow



Fansteel Metallurgical Corp.

JOINING A CYLINDER: Longitudinal welding of a molybdenum cylinder takes place inside an inert-gas-purged rectangular chamber.

Relate Current to Depth



Sciaky Bros. Inc.

BERYLLIUM WELD: Photomicrograph shows a weld made in beryllium using the electron beam. Total thickness of parts welded is 0.055 in.

around the heated surface. A sealed assembly entails added precautions. Try to assemble the parts after the chamber has been purged. You can also allow for "weep holes" so the gas can circulate during welding.

When welding in the open, you must use a gas-backed fixture. It can kill three birds with one stone if properly designed. A well designed fixture aligns the work. Its chilling effect reduces the extent of the heat-affected zone. Of course, it will also keep contaminants away from the underside of the weld zone.

Open-air welding seldom produces the ductile welds that you get in an inert chamber. A. F. Busto, welding engineer at Fansteel Metallurgical Corp., North Chicago, notes, however: "The percentage reduction in ductility is usually negligible in automatic or semiautomatic welding setups.

"Manual welding outside of a chamber," Mr. Busto adds, "introduces additional variables, and should be avoided where minimum contamination is required."

Fixture Styles — There are two general types of fixtures for Tig welding: longitudinal and circular. The former consists of a backup, grooved and drilled for gas flow.

In circular welds, an expanding backup ring-type fixture is used. The fixture should be preheated when you weld thin sections (0.025 in. or less). The range for molybdenum is 150°-200°F and 800°-1000°F for tungsten.

Has the electron beam had success in welding refractory metals? Yes, even tungsten has been welded. Here, low travel rates work out quite well. They tend to purify the weld metal. The electron beam narrows the weld zone as well as the heat-affected zone.

Plasma Jet—Researchers are also trying the plasma jet to weld tungsten. This process seems to narrow the welding zones even more.

Columbium reacts more with nitrogen than it does with oxygen. Its future looks promising, though. The Air Force has already called for a program to improve techniques to weld the metal. There's a great deal of alloying going on, which should enhance weldability.

The electron beam handles columbium without too much trouble. Tig welding works out well, too, especially when helium is used as the shielding gas. Columbium has been spotwelded successfully.

Strict Procedures — Since the standards are so strict in welding zirconium, procedures have to be more precise. In Tig welding, it's a good idea to switch to larger diameter nozzles and to make use of a weld chill with gas backing. Sections thicker than 1/16 in. should receive post-weld protection by means of auxiliary shields.

Also, there are several ways to control porosity. You can clean the joint edges by filing or polishing and/or you can reduce the welding speed. Then again, you can also cut down on the chill rate and/or even remelt the weld.

An Art—There's no set pattern for preparing the metal for welding. Whatever method you employ, clean the metal just before you start welding. Don't clean it, store it overnight, then expect to weld it the next day.

Cleaning is still an art, not a science. Where one man succeeds using a certain solvent, another man might fail. Proper cleaning does eliminate microporosity. Manufacturers of electron beam equipment point out that their units can produce sound welds without metal cleaning.

Much has been done in the field of welding reactive metals. Its future will be interesting to watch. The combined improvements in welding techniques and in more weldable alloys are certain to bring these metals into the industrial scene with dispatch.

Acknowledgments—Many companies cooperated in the preparation of this article. Special thanks are in order to the following: Air Reduction Sales Co., Battelle Memorial Institute, The Brush Beryllium Co., Fansteel Metallurgical Corp., Hamilton Electrona Inc., Linde Co., The Marquardt Corp., Pratt & Whitney Aircraft, Sciaky Bros. Inc., Titanium Metals Corp. of America, Vacuum Specialties Co., and the Watertown Arsenal Laboratories.

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Beryllium Bolts Gain Strength

On fasteners where weight is a problem and strength a must, beryllium bolts may serve well.

Chemical finishes combined with rolled threads put "B-Bolts" in a special class.

■ Beryllium bolts stand front and center to open up weight-savings possibilities in space and missile craft. Recent work by Standard Press Steel Co., Jenkintown, Pa., also points the way to their use in other structures.

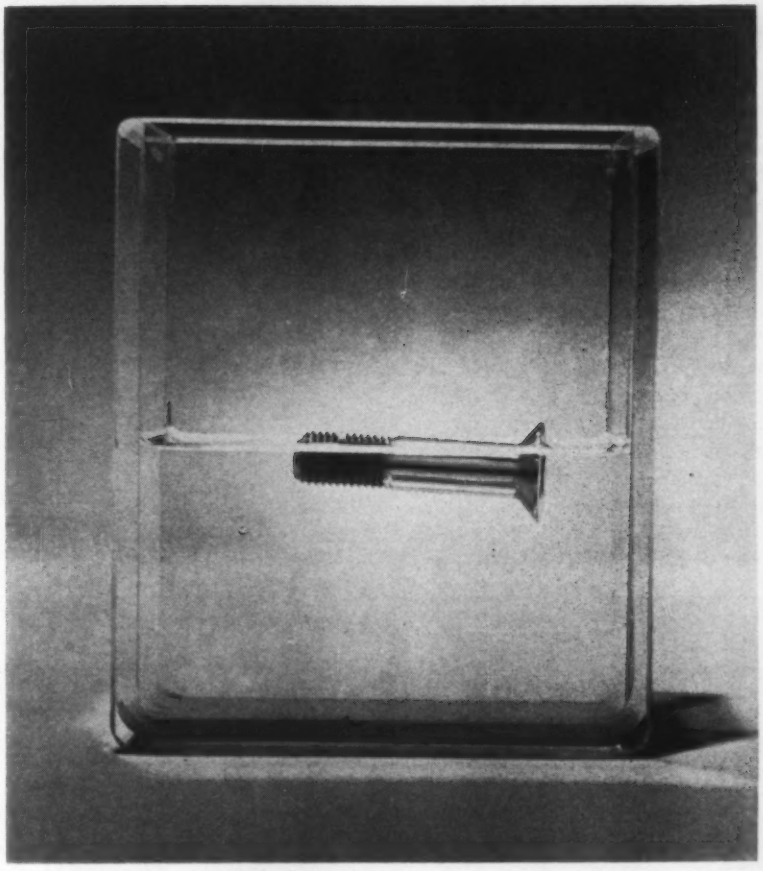
How can beryllium bolts aid airframes? Where two pounds of steel bolting is used, little more than one pound of beryllium will do the same job. This naturally permits heavier payloads.

Second Look — Development of the SPS bolt stems from two major processing methods. These new methods combine to conquer a beryllium bolt's notch sensitivity.

First, a chemical surface finish ends the detrimental effects of finish grinding on both static and dynamic properties. The finish improves transverse ductility and shear strength. The chemical finish also raises fatigue life 10-12 times higher than untreated samples.

An unusually large and rounded root was rolled in the thread. The large root radius, one and a half to two and a half times that of standard rounded roots, is tangent to the flanks of threads at a depth of only 55 pct of the full form. This thread design raises bolt life five to eight times over some existing standards.

Rolled Thread—Precision thread rolling is done with one pass. Other advanced methods include the compressive prestressing of fillet underhead by cold working. Controlled hot upsetting of the head to get proper grain flow is another.



UNSINKABLE BOLT: To show its lightness, a beryllium bolt floats freely in an aqueous solution of silver nitrate—a bit heavier than water.

To obtain the optimum in weight saving, there's an aluminum locknut for use on beryllium shear bolts. This locknut has a special tap-drill hole to mate with the special thread depth.

Bright Future—Beryllium fasteners and other special-headed and threaded parts have a bright future. The metal's outstanding nuclear properties, high thermal conductivity, atmospheric corrosion resistance, and high melting point—2350°F—all add to its potential.

Physical properties of the bolts include: A minimum shear strength of 60,000 psi; and an endurance (fatigue) limit of 45,000 psi. Beryllium weighs 23 pct less than steel.

The new beryllium shear bolts have exceptional fatigue strength. It's equal to some of the better steel bolts and out of all proportion to their other physicals. The beryllium bolt's endurance limit is actually equal to its yield strength.

Thirty years ago beryllium was expected to quickly find uses in the aircraft industry. However, the metal was soon shelved since it was prone to shatter like chalk under dynamic loading, even though static strength was adequate. The new bolts are evidence that, today the strength picture has changed.

Conveyor Lines Speed Assembly Of Precision Instruments

A conveyor-fed assembly system simplifies short runs on electronic instruments.

This reduces overstocking of finished units, while improving delivery schedules.

▪ Bucking the old adage that precision instruments aren't suitable for conveyor-line assembly, one instrument maker reaps the benefits of advanced planning and effective management-employee teamwork.

A new assembly line at the Leeds & Northrup Co., Phila., matches electrical-instrument supply to demand. This reduces inventories for parts by 50 pct. It also precludes the overstocking of finished instruments.

Problems Disappear—Other benefits include: Faster delivery schedules; improved quality control; a reduction in new-product lead time; and less chance of "stock outs."

Moving from one bench to another via conveyor lines, precise electrical instruments pass through all assembly stages. One line carries the assembled instruments into an air-conditioned room. After a 3-hour stabilization period, these instruments are calibrated, checked and packaged.

The new conveyor-type assembly system was developed to speed short production runs. It also reduces inventories for both materials in process and finished items.

ASSEMBLY STAGE: Worker, seated at a well-equipped console bench, assembles electronic instruments. Conveyor lines link assembly benches.

Old Bottlenecks—Under the old plan, when a stocked item reached the "reorder" point, production of a fixed quantity began for a new stock run. All instruments moved as a single unit through step-by-step assembly stages.

This old method has one major disadvantage. Any missing part holds up the entire batch. Thus, instead of having finished instruments ready within a few days, entire orders are often delayed by hard-to-find or out-of-stock parts.

Another big drawback centers on handling. Lots of time is lost in transporting assemblies from one bench to another. If an operator isn't able to start right in on a new batch of instruments, the delay is compounded at each stage.

Waste breeds waste: And production delays are no exception. Trucks, loaded with partially-finished assemblies, sometimes were idle for a day or more.

Close at Hand—Faced with these problems, L & N's engineers completely redesigned the instrument-production setup. First, they moved all the instrument makers close to each other.

Each worker now has a console, stocked with parts, right at his elbow. This saves trips to the stock-

MATCH ENVIRONMENT: Line in foreground carries instruments to air-conditioned calibration room.

FINAL CHECK: In the air-conditioned room, inspectors check out the instruments prior to packaging.

room. Roller-conveyor lines link all benches. Instrument assemblies travel on these lines from stage to stage.

When the new assembly system was ready to roll, the shop foremen were consulted for suggestions on how to put the plan into effect. Meetings were held every 2-3 weeks, until the switchover took place. This period lasted about 9 months.

Unwarranted Fears—When faced with a change in production methods, workers often express several fears. They're afraid they may lose their jobs. Sometimes they suspect that management hopes to alter existing incentive plans by pushing a speed-up in production.

If these misconceptions aren't corrected, workers may torpedo well-laid production plans. To insure snag-free operations, management's program was explained to the workers. They were assured that the new system was designed solely to yield more effective production schedules.

Two months prior to the changeover, the production foreman selected the workers who were best suited to the new system. In a conference, with union representatives present, he outlined the workers' role in the overall plan. Questions and suggestions from the workers helped to achieve a smooth transition.

Initial Effort—The first step in the new production plan's operation starts in the finished-goods stockroom. As each item is shipped, the stockroom foreman notes the shipment on a daily tally sheet. He lists all items by catalog number.

Before the start of the next day's work, this tally sheet reaches the production foreman. He notes the items needed and starts the ball rolling. On the sheet, there's a provision for items that are completely out of stock. These items are normally satisfied within two days.

As work starts on an item, a tag card is attached to the assembly. At the same time, a punch card is used to trigger inventory-reduction records.

Moving from bench to bench via the conveyor lines, the electrical instruments pass through all assembly stages. These stages include connecting, adjusting, checking, inspecting and packaging.

Everyone's Happy—The success of the plan hinges to a great extent on the storekeepers' work. These men keep a steady supply of parts within ready reach of the assembly workers. The storekeepers refill the bins next to the benches on a weekly basis.

As a spur to promote pride in the assemblers' work, the inspection department checks only 1 of every 4 units—after the first 60 have passed satisfactorily. Naturally, this reduces inspection costs.

With almost a full year's experience, both management and employees praise the new system. Starting with 9 laboratory items, the plan has been extended to cover 18 types. Other instruments will be added in the very near future.

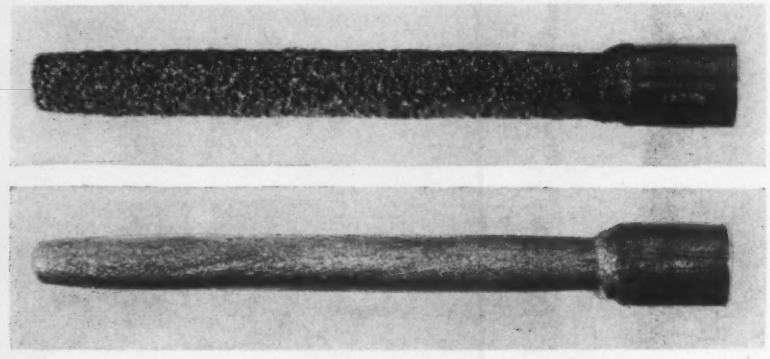
Can Uranium Improve Steel?

Researchers Seek New Uses for Once-Rare Metal

By **S. L. Gertsman**—Chief, Physical Metallurgy Div., Dept. of Mines and Technical Surveys, Ottawa.

No longer in the ranks of the rare and costly metals, uranium is bidding for non-nuclear jobs.

Tests show its promise as a steel-alloying agent.



STOPS PITTING: Steel anode (bottom) shows little pitting after immersion in hydrochloric acid. Alloying with 0.02-pct uranium is reason.

▪ Uranium is no longer considered too costly for many applications. The economics of its production has changed radically in recent years.

Steelmaking immediately suggests itself as an area for uranium research and development. Uranium has a high affinity for oxygen, nitrogen, carbon, sulphur and boron. All of these reactions are of interest to the steelmaker.

Kills Steel — Tests on 500-lb heats of steel show uranium to be an effective killing agent. The uranium was added as 1½ x ½ x ¼ in. pieces wrapped in aluminum foil. Recovery is about 25 pct. It's expected that when larger volumes of metal are treated commercially, the recoveries will be altered.

Early in the research, some peculiar properties were observed in steels containing uranium.

Normally, when a plain-carbon or low-alloy steel is used as an anode in an electrolytic cell, it shows a dark pitted surface after immersion in the acidic electrolyte.

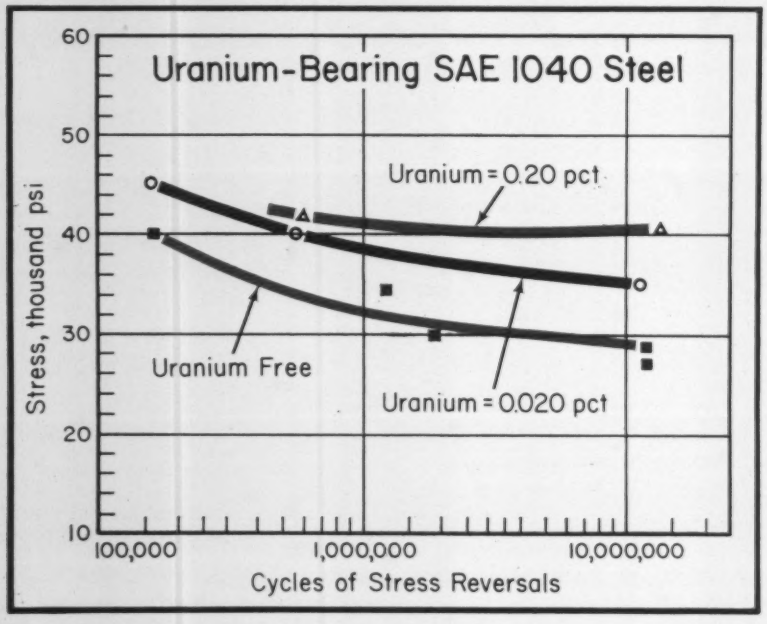
However, the surface of the uranium-bearing steel sample remains smooth, bright and lustrous although it has been subject to overall attack.

Resists Pitting—The photograph shows two samples after the electrolytic treatment. They are from the same heat of 0.40-pct carbon steel. The unpitted sample contains about 0.02 pct uranium whereas the badly pitted one has no uranium.

This lack of pitting has been confirmed for a series of 0.40-pct carbon steels containing up to 0.23 pct uranium.

Expose to Acids — Other corrosion tests were run in hot, (122°F) oxygenated solutions of nitric, sulphuric and hydrochloric acids. Result: The uranium-containing steels

What Happens to Fatigue Life?



showed less pitting and corrosion than the non-uranium-containing steels.

The table includes the weight-loss figures. This is a severe corrosion test. Hence, the weight loss for all tests was high.

Can this improved corrosion resistance in the lab be duplicated under service conditions? Marine tests are underway on a specially-fabricated chain and other specimens.

How About Fatigue?—It takes only a small amount of uranium to give a large increase in the fatigue strength of plain-carbon steels. Results are given in the first chart.

Note that the uranium-free steel has an endurance limit of 29,000 psi. Adding 0.02 pct and 0.20 pct uranium increases the endurance limit to 36,000 and 40,000 psi respectively.

The reason for the higher endurance limit of uranium-bearing steels has not yet been determined. It cannot be attributed to an increase in tensile strength; the fatigue: tensile ratio is also increased by adding uranium.

The higher fatigue strengths make uranium-containing steels attractive for such uses as shafting, railroad axles and springs.

Helps Stress Rupture — Stress-rupture tests of SAE 1010 and SAE 1040 steels show an increase in rupture time when uranium is added. It's also been found that increasing carbon at a constant uranium level improves the rupture life.

The second chart shows the amount of increase in stress-rupture life obtained by adding uranium to SAE 1010 steel. Without uranium, failure occurs almost immediately. Adding uranium produces very significant gains.

This feature should improve steels for nuts and bolts, steam piping and other items used at temperatures in the neighborhood of 1000°F.

Other Tests—Hardenability tests have also been made. The findings: Adding up to 0.32 pct uranium to steel has no effect. However, it's been found that the higher uranium contents, such as 0.7 pct, do affect hardenability.

Research work on non-nuclear uses of uranium is not confined to steelmaking. Work is also being carried out on cast iron-copper, aluminum-, magnesium-, and zinc-base alloys.

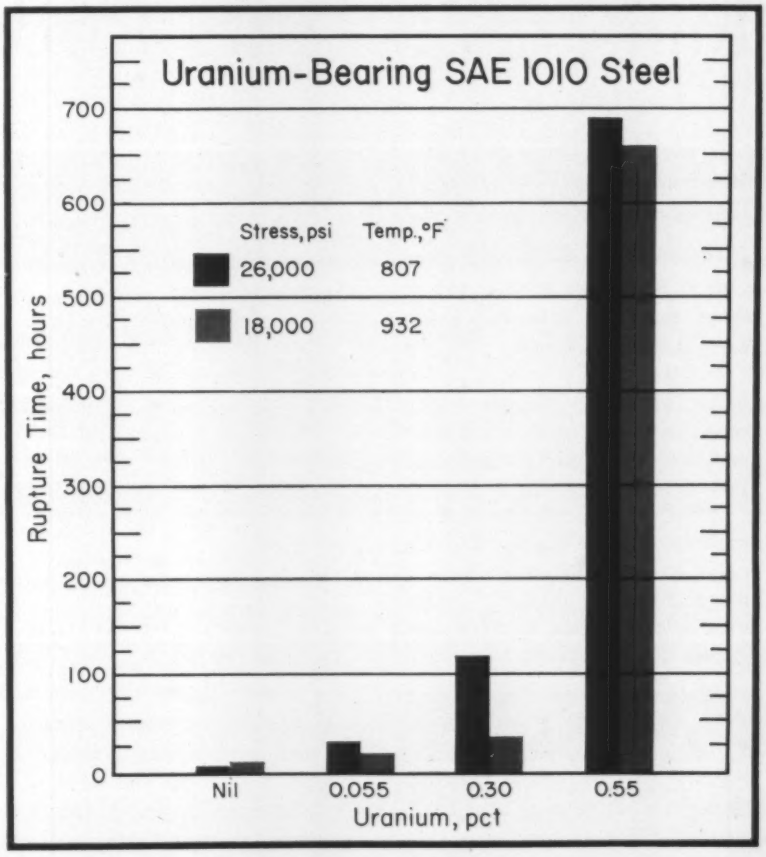
Alloying Curbs Corrosion Rate

URANIUM-BEARING 1040 STEELS

Acid*	Length of Test	Corrosion Rate, mils/year			
		0 pct U	0.07 pct U	0.12 pct U	0.23 pct U
14 pct HCl	10 min	13,200	3600	8150	4900
14 pct HCl	10 min	15,700	8000	9800	6950
10 pct H_2SO_4**	3 hrs	16,000	3650	5900	3550
10 pct H_2SO_4	3 hrs	14,800	3200	5850	3550
95–98 pct H_2SO_4	40 hrs	112	118	108	97
70 pct HNO_3	10 hrs	910	500	535	660

*—Oxygenated acids at 122° F. **—In contact with argon instead of oxygen.

Uranium Delays Stress Rupture



NO FLAWS ALLOWED: Stainless rods, slated for use in nuclear reactors, pass strict tests. Under-water sound waves detect even the smallest flaws. An oscilloscope presents a pictorial view of all imperfections.

Immersion Tests Reduce Waste

A nuclear reactor must have flaw-free support rods in its control-element mechanism.

The cost of machining these rods is high. This means that all flaws must be discovered, before machining begins.

▪ An ultrasonic-immersion tester serves as both a nuclear and Space Age tool at Armco Steel Corp.'s Baltimore Works.

Most of the stainless-steel bar products that are processed at this plant go into nuclear reactors. A recent shift from aircraft to nuclear uses reflects nuclear power's rapid growth in recent years.

High Standards—Although the industry served by this installation has changed, quality standards remain just as stringent. Ultrasonic-immersion tests satisfy these standards.

Armo's test setup offers dependable, semiautomatic operation. It permits a high-frequency search for resolution of minute flaws. At high frequencies, under - water sound waves detect flaws that escape notice by hand-probe methods.

The value of an immersion tester in checking these super-critical parts is unmatched. This tester pinpoints all flaws—before machining begins. Thus, it spots internal flaws that would have cropped up in final machining stages. This saves time and money.

Research Tool—Armco also uses the test setup as a research and development tool. It provides invaluable aid in testing new metals. It also serves a prime function in improving quality-control programs.

In the present setup, rounds from 1-6 in. in diameter and up to 16 ft in length can be tested. Once the operator sets the scanning head, the search unit automatically moves along the bar's length.

Round bars rotate at fixed speeds on powered rollers. The search unit's movement is synchronized with the rotation speed. This insures complete surface coverage.

Checks Heavy Forgings — To check square bars or large forgings that can't be adapted to the rollers, the operator uses a manual-scanning bridge. This bridge takes the place of the automatic scanning-head system.

All manual work is done at one end of the test setup. As a result, semiautomatic testing can be handled simultaneously at the other end of the machine.

During a test, the operator monitors a screen for results. He's aided in interpreting the oscilloscope by visual and audible flaw alarms. This helps him pinpoint, record and define all internal defects.

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Any sudden gap in your steel inventory suggests a rush order to Acme-Newport for preferential *Red Circle Service*. Your order bears a bright red circle that alerts the entire organization to your need for speed. This unusual service is the result of flexible operation and scheduling, modern equipment, and a series of laboratory checks that maintain highest quality even under pressure. When you need it good and you need it fast, ask Acme-Newport for *Red Circle Service!*

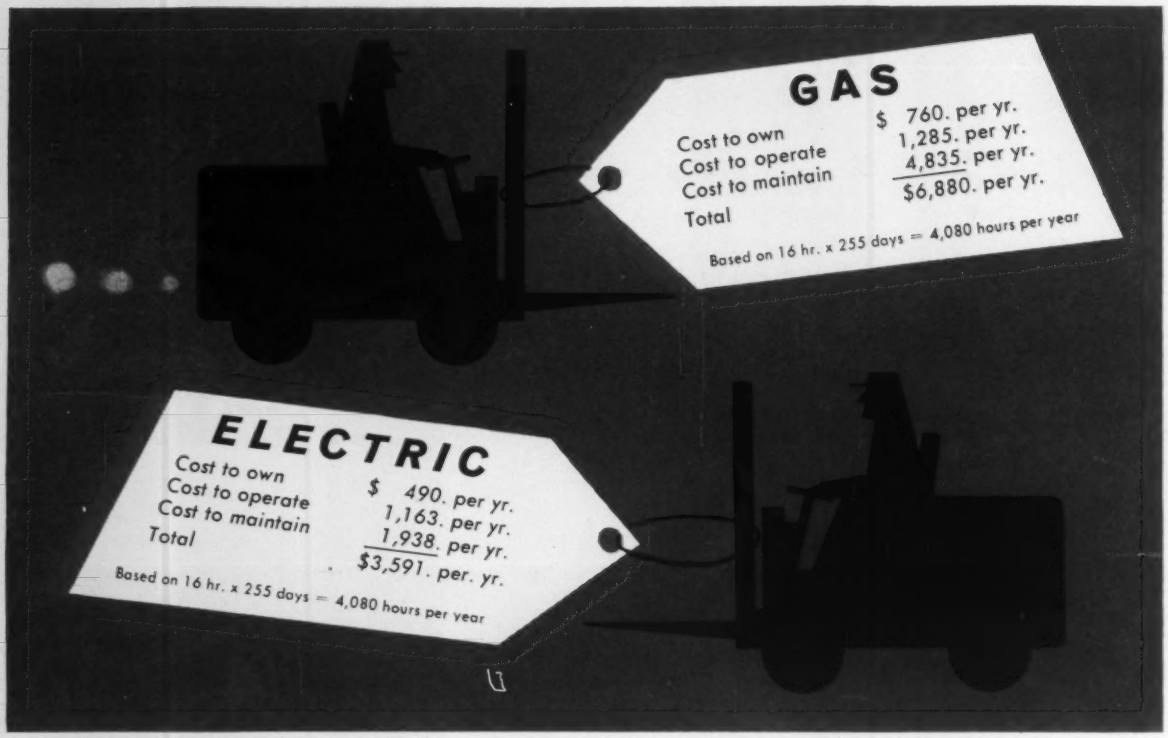
PRODUCTS OF ACME-NEWPORT STEEL

- Hot Rolled Steel in Coil
- Hot Rolled Pickled Steel in Coil
- Hot Rolled Sheets
- Hot Rolled Pickled Sheets
- Cold Rolled Steel in Coil (*full hard only*)
- Cold Rolled Sheets
- Alloy Sheets and Plates
- Plates (5/16" *and lighter*)
- Electrical Sheets
- Electric Weld Line Pipe
- Spiral Welded Pipe

Acme-Newport Steel COMPANY

NEWPORT, KENTUCKY

A SUBSIDIARY OF ACME STEEL COMPANY


GAS
Cost to own $ 760. per yr.
Cost to operate 1,285. per yr.
Cost to maintain 4,835. per yr.
Total $6,880. per yr.
Based on 16 hr. x 255 days = 4,080 hours per year
ELECTRIC
Cost to own $ 490. per yr.
Cost to operate 1,163. per yr.
Cost to maintain 1,938. per yr.
Total $3,591. per. yr.
Based on 16 hr. x 255 days = 4,080 hours per year

What's The Real Price Tag?

An ELECTRIC TRUCK can save you over *$3,200 per year*

The real price tag to look at on an industrial truck is the *cost per year,* not the initial price.

When you consider that what you are actually buying is not the truck but the *total amount of work that the truck will deliver,* an electric has been proven to be the best buy.

Here are the reasons:

- Electric trucks have at least double the working life of gas powered trucks because their mechanism is much simpler. This lowers depreciation cost and means that ELECTRICS COST LESS TO OWN.
- During the past twenty years the price of gasoline has doubled while the cost of electric power has remained constant. As a result, ELECTRICS COST LESS TO OPERATE.
- Actual maintenance records in industry prove that ELECTRICS COST LESS TO MAINTAIN.

Send for free 12-page booklet which gives further information on this subject and includes calculator charts which make it easy to make cost comparisons on your specific industrial truck operation.

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New Catalogues And Bulletins

Money-saving products and services are described in the literature briefed here. For your copy, just circle the number on the free postcard.

Chemical Products

Specifications on a variety of chemicals are contained in a comprehensive catalog. The publication gives directions for use and covers technical data. It describes bright dips and descalers, chemical wire and paint strippers, stop-offs for plating and painting, and other compounds. (Fidelity Chemical Products Corp.)

For free copy circle No. 1 on postcard

Unified Controls

Generator controls and automatic transfer switches are examined by a general bulletin. It illustrates a control that combines generator control circuits, transfer switch, optional engine-control panel and battery charger. (Lake Shore Electric Corp.)

For free copy circle No. 2 on postcard

Porcelain Enamels

Because new porcelain enamels for steel fire at only 1000-1100°F, lower furnace upkeep and fuel costs are possible. Low-firing enamel can also expand product lines. A 4-page folder gives full details on both these points. (Lead Industries Assoc.)

For free copy circle No. 3 on postcard

Release Agents

The shell molding process has made rapid progress in the foundry industry since its introduction. Shell-molding silicon release and parting agents with an equally long history are fully described in an 8-page publication. It provides a guide to help select a proper agent, describes materials and their properties and suggests techniques for using the compounds. (General Electric Co.)

For free copy circle No. 4 on postcard

Socket Adapters

Forty-two types of socket adapters for testing solder-terminal components are discussed in a new 12-page catalog. The adapters allow plug-in testing of all solder-terminal components. The text gives complete specifications and detail drawings of the units. (Electronic Engineering Co.)

For free copy circle No. 5 on postcard

Industrial Heaters

All the information on an oil-gas line of industrial heaters is available in an interesting brochure. The publication has descriptions, technical data, and application photos of the various heaters. One page shows diagrams of the various arrangements possible with auxiliary equipment. (Lennox Industries Inc.)

For free copy circle No. 6 on postcard

Thermoplastic Tanks

Valuable information for companies interested in themoplastic tanks and containers is available in a 4-page booklet. This literature illustrates and reviews a complete line of low-cost, polyethylene tanks. It also highlights facilities for extruding, molding, welding or thermally fusing polyolefin tanks to customer specifications. (American Agile Corp.)

For free copy circle No. 7 on postcard

Plating Components

The electrochemical and mechanical steps necessary for quality plating of electronic components are spelled out in a new brochure. Among the topics covered by the new literature are: Calculations as-

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FREE LITERATURE

suring adherence to specifications, pilot-plant trial runs, custom-built equipment needed for best results and quality control every step of the way. (Palumbo Bros., Inc.)

For free copy circle No. 8 on postcard

Torque-Measuring Unit

In 12-pages, a brochure analyzes the measurement of torque characteristics and speed of motors, gear trains and servo mechanisms. It investigates formulas for computing power and efficiency and methods of using stroboscopes and tachometers to studying rotating motion. (Power Instruments, Inc.)

For free copy circle No. 9 on postcard

Profit Analyzer

This literature advances the concept that air shipment of goods may, for some companies, reduce total procurement and distribution costs. The "analyzer" uses a simple rule-of-thumb to show if air freight would improve profits in any particular case. (United Air Lines)

For free copy circle No. 10 on postcard

Self-Locking Swage Nut

Self-locking swage nuts are featured and illustrated in a 4-page folder. It gives engineering, installation, dimensional and performance data. The performance data includes a size-by-size table of minimum tensile strengths for both coarse and fine threads. (Standard Pressed Steel Co.)

For free copy circle No. 11 on postcard

Cast Steel Shapes

Cast-to-shape steel products are examined by an attractive folder. The new literature explains the versatile facilities that produce the castings by conventional sand casting, shell molding or the ceramic molding process. Material data sheets on five principal grades of steel castings are included in each binder. (Vanadium-Alloys Steel Co.)

For free copy circle No. 12 on postcard

Hex-Head Locknuts

New torque-tension manual explains proper locknut installation. It includes 12 tables that list specific torque values for thin- and standard-height UNC and UNF locknuts. It discusses tightening torque and lubrication. It also tabulates tensile-stress areas and bolt strengths. (Elastic Stop Nut Corp.)

For free copy circle No. 13 on postcard

Conveying Systems

This new bulletin lists components, capacities and horsepower requirements. It gives complete instructions on how to easily and quickly select and order a pneumatic conveying system for a particular use. The systems handle any capacity from 1000-40,000 lb per hr. (Sprout, Waldron & Co., Inc.)

For free copy circle No. 14 on postcard

High-Frequency Tools

In 32 pages, a new catalog covers a complete line of electric tools. It informs readers on grinders, sanders, polishers, impact wrenches, screwdrivers, nutsetters, drills, reamers and balancers. It also analyzes the uses of high-frequency tools on specific jobs. (Thor Power Tool Co.)

For free copy circle No. 15 on postcard

Resquared Blanks

Want to pay only for the steel you use? This is the theme of a fold-out information sheet that tells all about a resquared metal-blank service offered to users of metal stock. The literature illustrates a new shearing-machine production line designed for this purpose. (Dolan Steel Co.)

For free copy circle No. 16 on postcard

Dry-Type Transformers

In two colors, a 36-page catalog gives the details on an extensive line of single-phase, 3-phase, and phase-changer, dry-type transformers. It's said to be the most complete catalog published for this type of equipment. The catalog is crammed with transformer photos, wiring diagrams, specifications and prices. (Atlantic Transformer Co.)

For free copy circle No. 17 on postcard

Building-Block Tools

Modular building-block machine tools are reviewed by an 8-page brochure. It passes on information about new specialized machines, automated equipment and conversion of existing planer, milling and drilling equipment. (S & S Machinery Co.)

For free copy circle No. 18 on postcard

NEW PATENTS

Coat With Aluminum

Method of aluminizing ferrous materials, C. J. Owen (assigned to Hubbard & Co.), Dec. 6, 1960. To coat ferrous metal articles with aluminum or aluminum alloys, immerse them in a fused salt bath composed of sodium chloride, potassium chloride, cryolite, and potassium chromium fluoride. Then transfer the articles to a molten aluminum bath. Removal and drying completes the process. No. 2,963,384.

Manganese Steel Alloy

Austenitic steel alloy, C. H. Armitage (assigned to Allis-Chalmers Mfg. Co.), Dec. 20, 1960. An autenitic manganese steel alloy has high wear resistance, good ductility and excellent work hardening properties. It comprises preferably 1-1.25 pct C, 6-8 pct Mn, 2-4 pct Cr, 0.05-0.15 pct Al, and the balance essentially all Fe. No. 2,965,-478.

Controls Pulp Feed

Plant-operating control means, A. S. Henderson and E. W. Davis (assigned to Reserve Mining Co.), Dec. 20, 1960. A control system maintains the density and quantity of pulp being fed to the classifier in a taconite-benefication plant. This promotes reproducible classification at maximum tonnage. No. 2,965,316.

Refines Grain Size

Production of fine-grained metal castings, G. Pestel, F. C. Langenberg and C. R. Honeycutt (assigned to Crucible Steel Co. of America), Dec. 13, 1960. Improved methods and apparatus refine the grain of alloy steels and other metals which tend to form relatively large grains on solidification. No. 2,963,758.

Copies of U. S. Patents are available at 25¢ each from Commissioner of Patents, Washington 25, D. C.

$800 MORE PER TON FROM TURNINGS

American Rolling Ring Metal Turnings Crushers quickly pay for themselves. Savings of approximately $4.00 per ton through extra cutting-oil recovery from crushed turnings often pay for the crusher in a short time. In addition, uniform chips command a higher price (up to $4 more per ton). Add to this the valuable savings in storage space (up to 75% less), the easier handling, the heavier car loadings possible, and you have tremendous profit advantages with the American Crusher working in your plant.

If your turnings amount to 20 tons or more a month, there's an American Crusher designed to pay off big for you.

American has manufactured Turnings Crushers since 1917 and makes a wide range of models with capacities from 1 ton to 50 tph.

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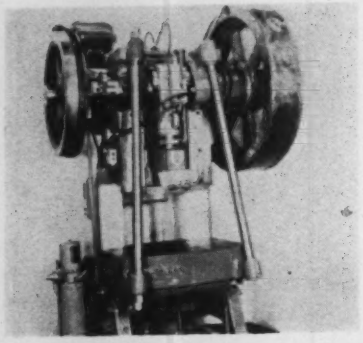
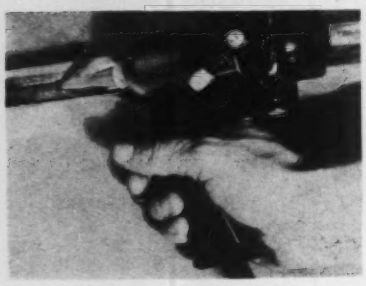
New Materials and Components



Power-Press Attachment Halts Overload Damage

Here's an attachment that fills a long-felt need. It's a hydraulic overload pitman that replaces the pitman or strap on just about any power press. The new unit definitely eliminates any damage to the press, crank or frame. Its calibrated relief valve adjusts to any working tonnage. Thus, the press never exceeds its maximum capacity. Or, you can set the pitman to protect a given set of tools or dies. A pneumatic pumping unit keeps a constant oil pressure on the pitman cylinder. This means it's always precharged to the desired working pressure. The attachment is a great advantage on "double-header" forming jobs. (Dayton Rogers Mfg. Co.)

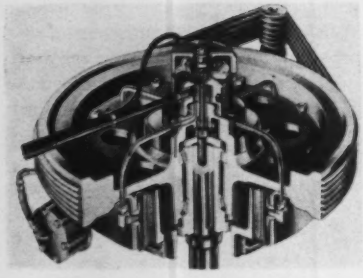
For more data circle No. 25 on postcard, p. 115



New Brazing-Alloy Form Halves Brazing Time

Powdered brazing alloys, mixed with a high-viscosity vehicle, offer unusual ease of application. These alloys, in their convenient paste form, also speed the work. For production jobs, they're applied with an unusual air gun. This reduces alloying time by 50 pct. An entire line of brazing alloys comes in the new form, for use wherever the powdered material was applicable. This includes stainless-steel and high-alloy brazing. The alloys are ideal for high-temperature service. (Wall-Colmonoy Corp.)

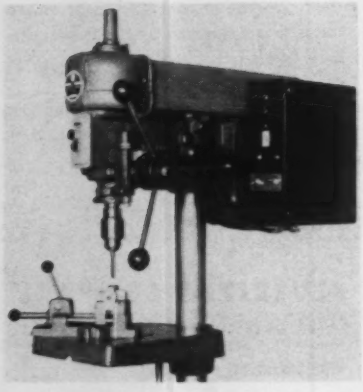
For more data circle No. 26 on postcard, p. 115



Pneumatic Unit Starts and Stops Small Presses

A miniature clutch and brake package suits low-tonnage presses. It's ideal for high-speed cyclic machines that require extremely accurate starts and stops. The air-actuated clutch responds instantly to push-button control. It adjusts itself for wear. If electricity or compressed air fails, the spring-engaged brake automatically takes hold. Thus, there's fail-safe operation. This stops backlash, protects tools and dies. The unit has a 6-in. diam, drum-type clutch and a 4-in. diam brake. (Fawick Corp.)

For more data circle No. 27 on postcard, p. 115



New Unit Converts Drill Press for Tapping Jobs

The addition of this unit converts any standard drill press to a tapper and drill press combination. You can use the same fixtures for both operations. Changing from drilling to tapping is as easy as flipping a toggle switch. Another similar switch converts from right- to left-hand threads. The electronic device consists of two units: An electrically-interlocked, reversing control panel and a hand feed wheel with switching control. The panel attaches to the drill-press head. Both components mount easily. The combination synchronizes vertical spindle travel and tap rotation. At the instant the handwheel reverses the direction of spindle travel, tap rotation also reverses. Thus, the tapping depth is automatic. There's no need for clutches. (Power Control Products, Inc.)

For more data circle No. 28 on postcard, p. 115

Adapts Pressure Lines

Designed to adapt pressure lines to threaded connectors, a filling connector has an expanding seal. Actuating the hand cam lever causes the flanged rubber bushing to expand against the side walls of the opening. The flange presses against the outside face of the fitting. This effects a leak-proof seal. A retaining collar bears on the filling connector. It's internally threaded to screw onto the test-vessel connection. The purpose of the retaining ring is to give extra holding power for the connector during admission and holding of high pressure. (Mechanical Products Corp.)

For more data circle No. 29 on postcard, p. 115

Comparator Screen

Where close-checking accuracies are a must, a new, optical-comparator screen offers many advantages. You can clean the charts hundreds of times without weakening the lines. An extremely efficient light-diffusing material promotes photographic accuracy with great visual contrast, maximum light diffusion and a minimum of surface reflection. Coating the charts with lacquer or smearing them with oil doesn't affect light diffusion. There are no screen hot spots. (Automation Gages, Inc.)

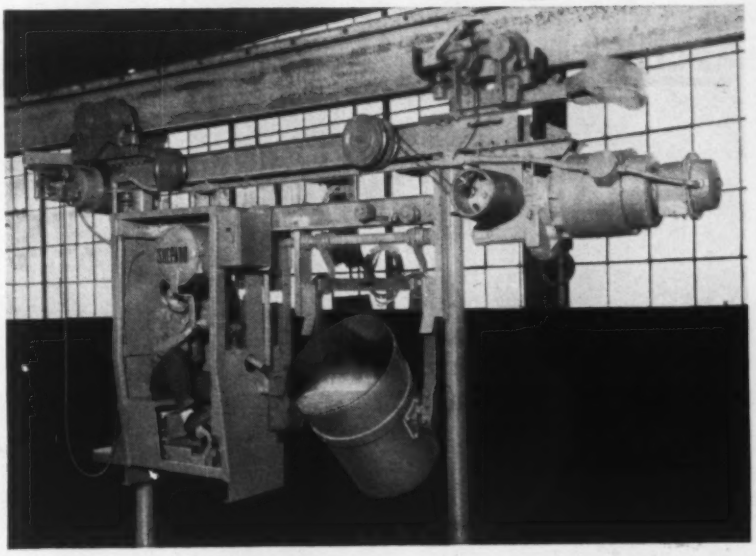
For more data circle No. 30 on postcard, p. 115

Tracer Control

Easily-installed, this co-ordinate tracer control does not modify the machine tool in any way. It's compatible with any screw-feed or feed-rod lathe, mill, shaper or planer. Converting from trace to normal machine operation is a matter of seconds. A hydraulic co-ordinator valve meters fluid to the motors. This gives the cutting tool a constant feed rate over a workpiece. The valve spool oscillates at 100 cycles per minute. The result is a very light stylus pressure and constant stylus deflection. This feature assures repetitive accuracy. The valve responds and repeats within 0.0002 in. (Bansbach Machinery Co., Inc.)

For more data circle No. 31 on postcard, p. 115

JOB-MATED



for Hot Metal Handling

Shepard Niles Hot Metal Carrier

It only takes **one man** to move and pour hot metal — swiftly and safely — with a Shepard Niles Hot Metal Carrier. And because each carrier is **JOB-MATED** — built with the components best suited to meet **your** exact on-the-job conditions — it will last longer, require minimum maintenance and practically no downtime. Care like this in our plant means significantly lower cost operation in yours.

For full details on this labor-saving method of low-cost handling, write for latest bulletin. Ask to have a Shepard Niles representative call.

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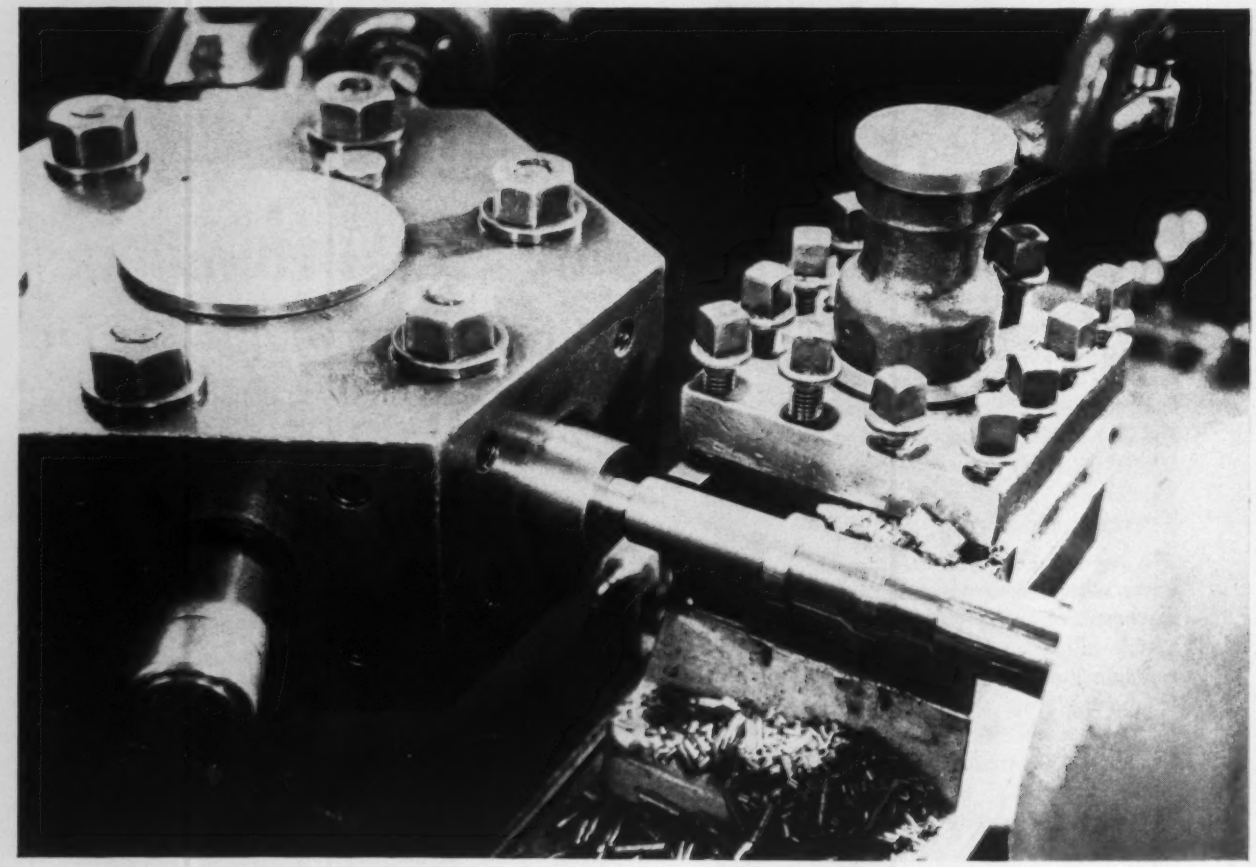
CONTROLLED HARDNESS—Your key to costs with Armco Stainless Types



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Durability, Strength, Economy

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Special Armco Process Tightens Controls on Hardness Range

Uniformity you can rely on. That's the cost-saving advantage of Types 410 and 416 Armco Stainless Steels specially heat treated for *Controlled Hardness.*

For example . . .

Bars supplied to standard ranges Rockwell C26-32 or C32-38 show consistency of hardness far superior to that of regular hardened and tempered Types 410 and 416. This holds true with equal ranges anywhere between Rockwell C26 and C38.

Simplify shop routing. Eliminate problems of surface and distortion caused by excessive hardness variations. Order Types 410 and 416 stainless steel with *Controlled Hardness* from a steel service center listed in this ad. They are available in the same broad range of sizes, shapes, finishes and tolerances as regular Types 410 and 416. Armco Division, Armco Steel Corporation, 1651 Curtis Street, Middletown, Ohio.

Get Armco Stainless Steels from these Steel Service Centers

(A) Sheets, Strip and Plates (B) Bars and Wire

AMERICAN STEEL & ALUMINUM CORP. (AB)
Hartford, Conn.

AMERICAN STEEL & ALUMINUM CORP. OF MASS. (AB)
Cambridge, Mass.

BROWN-WALES COMPANY (AB)
Cambridge, Mass. – Auburn, Maine – Worcester, Mass.

CENTRAL STEEL & WIRE COMPANY (AB)
Chicago, Ill. – Cincinnati – Detroit – Milwaukee

CHICAGO STEEL SERVICE COMPANY (AB)
Chicago, Ill.

CLEVELAND TOOL & SUPPLY COMPANY (B)
Cleveland, Ohio

THE CONGDON AND CARPENTER COMPANY (AB)
Providence, R. I. – Fall River, Mass.

C. A. CROSTA, INC. (A)
Denver, Colo.

DUCOMMUN METALS & SUPPLY COMPANY (AB)
Los Angeles, Calif. – Berkeley – Phoenix – San Diego – Seattle

EDGCOMB STEEL & ALUMINUM CORP. (AB)
Hillside, N. J.

EDGCOMB STEEL COMPANY (AB)
Philadelphia, Pa. – Charlotte, N. C. – Greensboro, N. C. – York, Pa.

ESCO CORPORATION (AB)
Portland, Oregon – Denver – Emeryville, Calif. – Eugene, Oregon – Honolulu – Los Angeles – Seattle – Spokane – Vancouver, B. C.

PETER A. FRASSE & COMPANY, INC. (AB)
New York, N. Y. – Buffalo – Hartford – Lyndhurst, N. J. – Philadelphia – Syracuse

FIRTH BROWN STEELS LTD. (AB)
Montreal, P. Q. – Toronto

GATE CITY STEEL, INC.—OMAHA (A)
Omaha, Nebr.

INDUSTRIAL STAINLESS STEELS, INC. (B)
Cambridge, Mass.—Buffalo, N. Y.

EARLE M. JORGENSEN COMPANY (AB)
Los Angeles, Calif.—Dallas—Denver—Honolulu—Houston—Oakland—Phoenix—Seattle—Tulsa—Wichita

MAPES & SPROWL STEEL COMPANY (AB)
Union, N. J.

METAL GOODS CORPORATION (AB)
St. Louis, Mo. – Dallas – Denver – Houston – Memphis – New Orleans – N. Kansas City, Mo. – Tulsa – Wichita

MONCRIEF-LENOIR MFG. COMPANY (AB)
Houston, Texas – Dallas – Harlingen – Lubbock – San Antonio – Temple

MORRISON STEEL COMPANY (AB)
New Brunswick, N. J.

THE ORLEANS STEEL PRODUCTS COMPANY, INC. (A)
New Orleans, La.

WILLIAM M. ORR COMPANY, INC. (AB)
Pittsburgh, Pa.

PAPER-CALMENSON & COMPANY (A)
St. Paul, Minn.

RICHARDS & CONOVER STEEL & SUPPLY COMPANY (A)
Kansas City, Mo.

SEABOARD STEEL & IRON CORP. (B)
Baltimore, Md.

SENECA STEEL SERVICE, INC. (AB)
Buffalo, N. Y.

SOUTHER STEEL & ALUMINUM COMPANY (A)
St. Louis, Mo.

J. M. TULL METAL & SUPPLY CO., INC. (AB)
Atlanta, Ga. – Birmingham – Greenville, S. C. – Jacksonville – Miami – Tampa

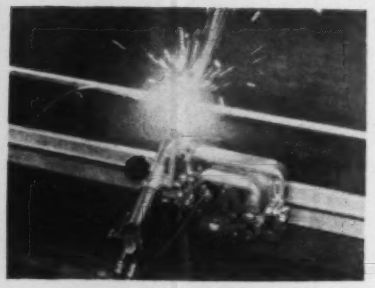
VIKING STEEL COMPANY (AB)
Cleveland, Ohio

VORYS BROTHERS, INC. (AB)
Columbus, Ohio

YORK CORRUGATING COMPANY (A)
York, Pa. – Washington, D. C.

ARMCO **Armco Division**

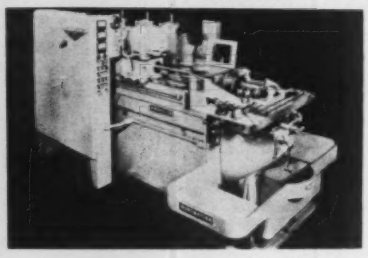
New Equipment and Machinery



Flame Cutter Moves Freely, or at Preset Speed

Basically, this unit is a self-propelled flame cutting machine. But, that's not the whole story. It bevels, gouges, trims or welds. The cutter's variable-speed carriage mounts on a geared aluminum channel. The carriage moves freely, or at controlled speeds along its channel. It can't come off, regardless of the rail positions. Strong permanent magnets hold the rail firmly in place. Not even vibrations caused by heavy-equipment movement, have any effect on the magnetic grip. (Weld Tooling Corp.)

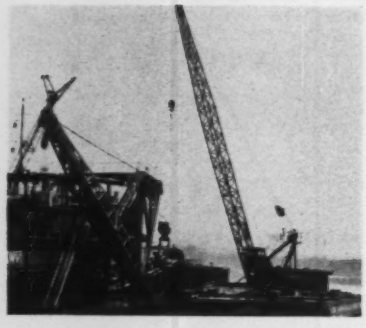
For more data circle No. 35 on postcard, p. 115



Gun-Drilling Machine Ends Drill-Breakage Worry

An electronic monitoring system takes the guesswork out of deep-hole or gun drilling with this new drilling machine. Any deviation from smooth, normal drilling incites the system into immediate action. The drill stops feeding before damage occurs to workpiece, tool or machine. Another important feature is its simple operation. Once the workpiece is clamped, the machine automatically finishes the job. (Drillmation Co., Inc.)

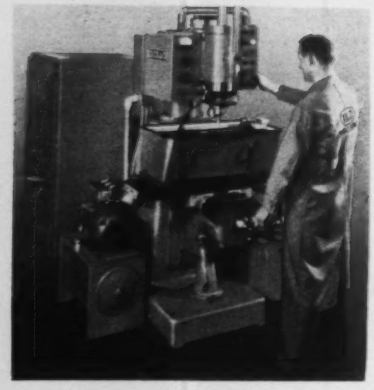
For more data circle No. 36 on postcard, p. 115



Compact Crane Weighs 30 Tons, Lifts 50 Tons

Single-column mounting and short tail swing give a new crane a surprisingly small space requirement. Here's why. High-strength steel reduces column size. Also, single-point, swing-table suspension eliminates counterweights, hook rollers and live roller circle. Further compactness results from a simple drive system. Each crane function is directly driven by an individual, high-torque gearmotor. Thus, there are no clutches, transmissions or long power-transfer systems. The electric gearmotors give a constant-mesh power train, which keeps power on the load at all times. This means positive control. (R. G. LeTourneau, Inc.)

For more data circle No. 37 on postcard, p. 115



New Unit Machines With Electrical Discharges

Departing from conventional metal-cutting processes, a machine tool recently reduced production time on an aircraft part by 500 pct. It virtually eliminated scrap. Tooling and fixturing were simple. The machine represents a new approach to metalworking. A dielectric fluid covers the tool and workpiece. When the tool, or electrode, is in close proximity with the workpiece, a heavy electrical discharge flashes across the gap. This effects controlled metal removal from the part. At the end of the machining cycle, the workpiece bears the mirror image of the electrode tool. The new unit does many "impossible" machining jobs. Tough, hardened materials and difficult shapes fall within its scope. Also of interest, the material is not work hardened by the process. (Ex-Cell-O Corp.)

For more data circle No. 38 on postcard, p. 115

Tackles Any Weld

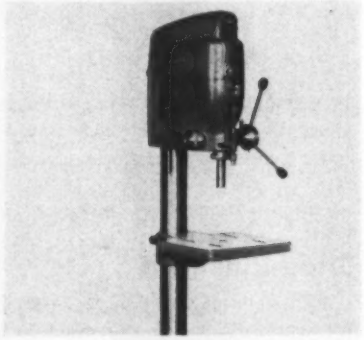
Optional equipment converts a new ac-dc arc welder to suit any type of welding job. The 300-amp, silicon-rectifier model operates from single-phase ac and delivers ac current to the welding arc. It also provides straight- or reverse-polarity dc. Built-in, high-frequency equip-

ment means you can tackle any Tungsten-Inert Gas, metal-arc welding application. A stepless rheostat controls intensity. Solenoid valves meter water and gas. Here's why maintenance is easy: A hinged door exposes all the relays; a front inspection panel covers the solenoids; the rear panel exposes the rectifier assembly and primary terminal connections. (Westinghouse Electric Corp.)

For more data circle No. 39 on postcard, p. 115

Drill Press

Boasting a speed range of 600-4000 rpm, a production drill press offers variable speed control with



no belt shifting. Other features include: Rugged design with 3¼-in. diam seamless-steel column; smooth spindle drive with 18-tooth involute spline; optimum safety with motor, belt and sheaves all enclosed. (The Electric Mechano Co.)

For more data circle No. 40 on postcard, p. 115

Tests Weldments

Non-destructive field inspection of many welding jobs becomes a reality with a new magnetic-particle tester. The portable unit produces 1000 amp on either ac or half-wave dc current. Applications are apparent in the aircraft, petroleum, atomic and marine fields. (Picker X-Ray Corp.)

For more data circle No. 41 on postcard, p. 115

Engine Lathe

A host of quality features distinguish this new engine and toolroom lathe. Here are just a few of them: All-geared head stock, driven by a 4-hp motor; chrome-nickel steel shafts and gears, hardened and

When close fits have to be "run-in"...

consider Lubri-Case

(-the sulphur case lubrication process that eases run-in of ferrous precision assemblies)

Close tolerance assemblies with ferrous mechanical parts produce the problem of break-in without breakdown of lubricity between design elements. Lubri-Case treatment of mechanical parts provides for quicker run-in with little or no scuffing, scratching or seizing.

For such parts Lubri-Case, a sulphur case treatment, produces a case high in sulphur on most ferrous materials imparting load bearing, long wearing, lubricating properties even in castable and machineable low cost iron and steel. Lubri-Case has been use tested in many applications under high speeds, heavy loads, elevated temperatures and close tolerances.

Drever Company, heat treating specialists since 1939, can Lubri-Case process your "specials" or your production quantities. Write or phone for further details.

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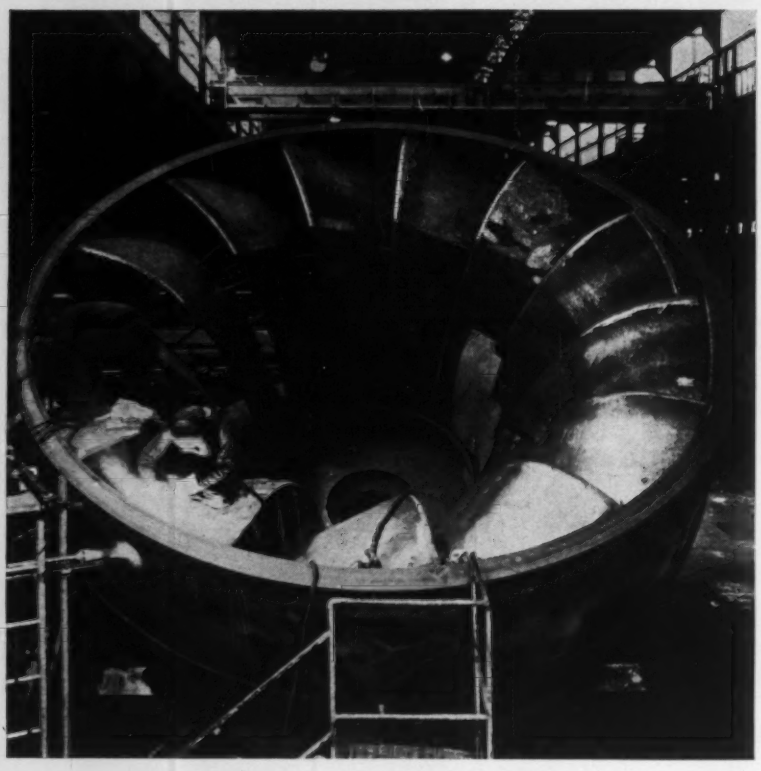
WELD WITH ARCOS STAINLESS ELECTRODES



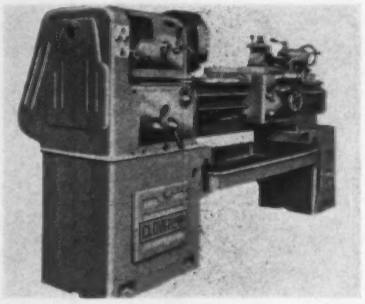
Job Report Courtesy of Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin

Hydraulic turbine runner blades overlaid to resist cavitation. To protect the blades of this huge hydraulic turbine runner from the destructive effects of water wear, Arcos stainless rods were selected for overlaying critical areas. The precise chemical and metallurgical properties of Arcos stainless rods—assuring uniform, predictable results—make this process both dependable and economical. Meet your stainless welding requirements with Arcos—the most complete selection available anywhere.

ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

ground; double-roller and taper-roller bearings on the spindle. It has a swing of 14 in. over the bed and 20 in. over the gap. It's made in

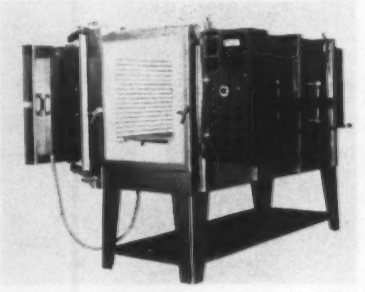


two bed lengths, either 40 in. or 60 in. between centers. (Hermes Machine Tool Co.)

For more data circle No. 42 on postcard, p. 115

Versatile Furnace

Its wide temperature range makes a new furnace suitable for heat treating, drawing or glass annealing. With fans removed, it gives controlled temperatures from 300°-2300°F; with forced-convection fan, 150°-1875°F. Special holders support the heating elements which provide excellent heat-transfer properties. A low-mass characteristic keeps overshoot and undershoot of the temperature control point to



an absolute minimum. This is especially true when using automatic temperature controls. (L & L Mfg. Co.)

For more data circle No. 43 on postcard, p. 115

Slide-Rule Kit

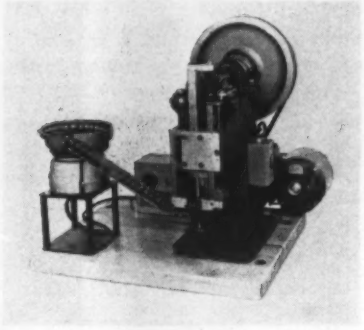
With this kit you can design and construct a special purpose slide rule for recurring calculations connected with any particular job. An

illustrated booklet shows how to assemble different types of slide-rule blanks from the parts furnished by the kit. It also explains the theory of slide rule design, and tells how to express almost any type of problem or equation on a special purpose slide rule. (Dyna-Slide Co.)

For more data circle No. 44 on postcard, p. 115

Inserts and Sets Pins

An electric foot switch operates a new turret-terminal riveting machine. The low-cost unit inserts and sets all makes of electronic terminals, base pins, etc. at speeds in excess of 2000 per hr. Thus, it's tailored to the electronic and electrical industries for setting electronic terminals in printed circuit boards. A vibratory hopper insures continuous flow of the terminals to the riveting jaws. Electrically-interlocked microswitches provide fail-safe operation. The hopper and track handle various turret-terminals with no change of tooling. (Eyelet Tool Co.)

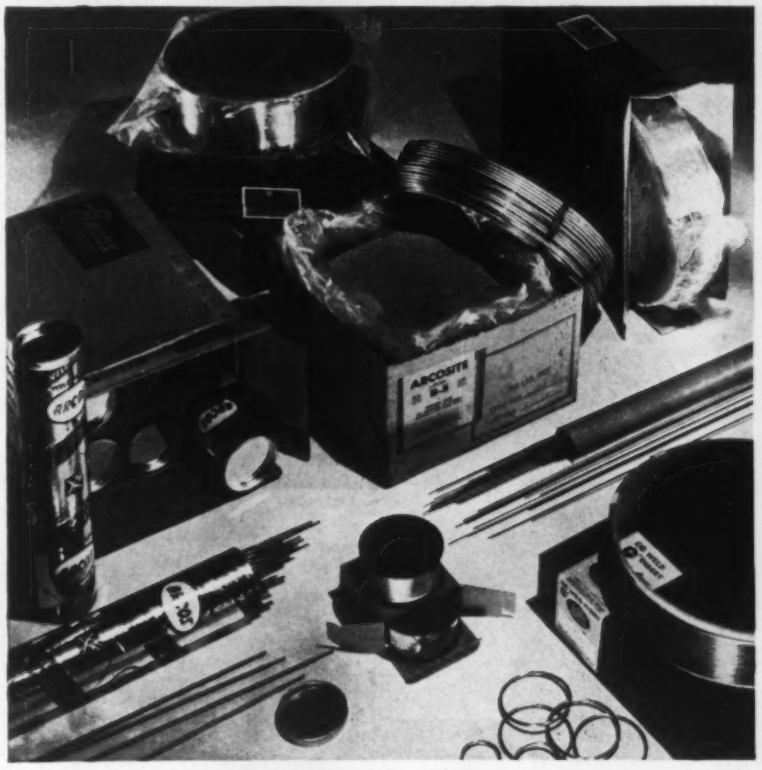


For more data circle No. 45 on postcard, p. 115

Multihead Welder

Made as a standard unit with 4, 8, or 12 heads, a new multihead welder features cascade firing to prevent high power demand. All the heads come down at once; the transformers fire one after the other. Each head has its own cylinder and can be adjusted individually. Each head also has its own shut-off valve. All transformers have a timer and on-off switch. This allows for use of all or any combination of heads. Additional features include: Squeeze and hold timer and two-stage foot switch arrangement. Simple adjust-

WELD WITH ARCOS FOR QUALITY WELD METAL



Arcos offers a complete line of filler metals for welding stainless, low alloy steels, mild steels, aluminum, and for hard surfacing . . . manually or automatically. Arcos covered electrodes, electrode wires, and filler rods are available for manual arc, submerged arc, inert gas, CO_2 shielded, and electroslag processes. The quality of all Arcos filler metal products, including fluxes for submerged arc welding and EB Inserts for root pass welding, is carefully controlled. *Make* sure it's Arcos . . . *be* sure of top performance.

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offers consistent uniformity in Oil-Tempered

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Wires

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NEWCO means quality

NEW ENGLAND HIGH CARBON WIRE CORP.

MILLBURY, MASSACHUSETTS

Offices and warehouses: Cleveland, Detroit, Los Angeles, Melrose Park and Millbury

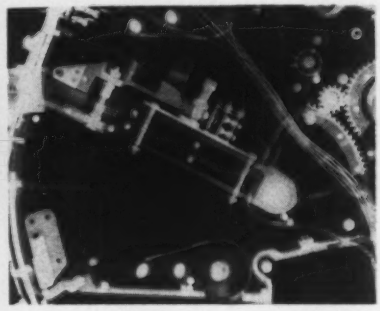
NEW EQUIPMENT

ments reduce set-up time to a minimum. (Alphil Spot Welder Mfg. Corp.)

For more data circle No. 46 on postcard, p. 115

X-Ray Paper Cuts Costs

An industrial X-ray paper is low in cost; and it gives 4- to 6-pct sensitivity. It's excellent for finding flaws in sharp-contrast items such as electronic assemblies, tires and metal-to-metal bondings. Processed in the usual way, the economical paper yields a durable print, free from fogging. Another advantage is direct inspection without using special viewing equipment. You get a glossy print on a stiff paper base —not a film. (Picker X-Ray Corp.)



For more data circle No. 47 on postcard, p. 115

Heavy-Duty Container

The prime feature of a heavy-duty wire container is its ability to stack. In this way, it saves valuable floor space. The container boasts a holding capacity of 6000 lb. Its construction provides a visible inventory and makes it self-cleaning. The base of the container permits easy access for fork trucks and cranes. This hastens the movement of parts and materials. With or without drop sides, it comes in two sizes: 48 x 53 x 38 in. and 42 x 53 x 38 in. (Springport Steel Products Co.)

For more data circle No. 48 on postcard, p. 115

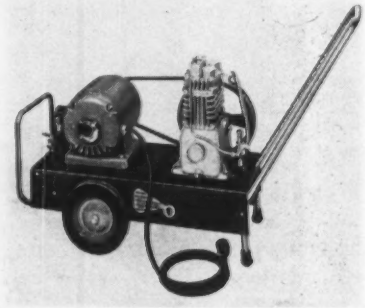
Grinds Odd Shapes

Advanced safety features plus convenient stock handling are features of a new 7-in., ½-hp grinder that is available in bench and pedestal models. The unit's safety shields contain shatter-proof glass to protect the operator's eyes. Inside the shields, shaded bayonet-type bulbs prevent glare while illuminating the face and both sides of the wheel. Wheels are balanced. Additional safety features include removable steel plates covering the sides of the wheels, adjustable spark deflectors and heavy cast-iron guards with integral dust chutes. (Rockwell Mfg. Co.)

For more data circle No. 49 on postcard, p. 115

Mobile Compressor

Ideal for spray-painting, all-purpose spraying, air cleaning and automatic-tool operation, this modern compressor fulfills the needs of painting contractors, rental outlets, plant maintenance, production shops and garages. It gives commercial users a high-volume, heavy-duty source of air power, plus convenient portability. Available with either a 1-hp electric motor or a 3-hp gas engine, the twin-cylinder compressor provides 5.4 cfm at 45



psi, 4.0 cfm at 100 psi. Working pressure is 100 lb, continuous operation; 150 lb, intermittent. (The Campbell-Hausfeld Co.)

For more data circle No. 50 on postcard, p. 115

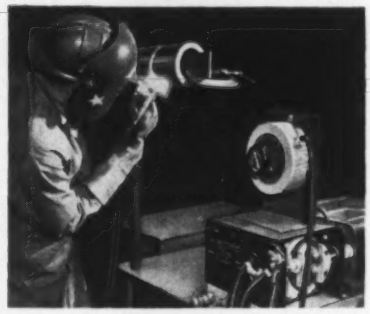
Two-Bearing Screen

New in every detail, an inclined vibrating screen is available in a complete range of screen sizes up to 6 by 16 ft. Slow, medium and fast screening is obtained by the simple adjustment of the entire vibrating unit. Vibration amplitude is altered by adjusting weights. The entire mechanism has an oil lubrication system for all moving parts. (Aggregates Equipment, Inc.)

For more data circle No. 51 on postcard, p. 115

Welds Thin Metal

This manual welding gun is particularly suited for gas-shielded, metal-arc welding of thin-gage ferrous metals. It boasts ruggedness, high duty cycles and an absolute minimum of downtime. These qualities make it most appropriate for the auto industry and other mild-steel fabricators. Goose-neck design and light weight permit access to normally difficult spots. The welder uses 0.035- and 0.045-in. steel wires from many different wire feeders. (Air Reduction Sales Co., a div. of Air Reduction Co., Inc.)



For more data circle No. 52 on postcard, p. 115

Produces Keyways

An automatic feed arrangement is incorporated in an improved compact keyseater. The machine produces precision keyways up to 1¼-in. wide and 9-in. long. It's ideal for use in toolrooms and on low and medium-rate production parts. Standard, high-speed steel cutters,

METALLURGICAL LABORATORY SAMPLING

MANCO HYDRAULIC GUILLOTINE

for bend ductility tests and punching test slugs

A compact unit with bench stand for permanent mounting on laboratory bench tip. Provides 35 tons thrust for bend test to determine bend ductility of uncoated steel stock or the adherence and ductility of sheet coatings. Capacity up to .164 mild steel. Interchangeable punch tooling produces undistorted 3½" diameter blank slug from mild steel up to .067. *Available complete with power unit.*

Write for Complete Information

MANCO Mfg. Co., BRADLEY, ILLINOIS

What makes the first gear-type coupling still first choice?

Check design . . . and you'll find Fast's Couplings (the original gear-type couplings) are superbly engineered, ruggedly built, smoothly running units designed to outlast the machines they connect.

Check completeness of line . . . and you'll find Fast's Couplings come in a complete range of sizes and types for shafts from ½" to 32" and larger.

Check service . . . and you'll find Fast's Couplings are backed by expert help from experienced field engineers . . . while outstanding stock facilities throughout the country insure speedy delivery of your coupling orders.

Check popularity . . . and you'll find Fast's Couplings are the choice of more industrial equipment manufacturers than any other shaft coupling.

Check Fast's for your coupling needs today.

KOPPERS COMPANY, INC., 204 Scott St., Baltimore 3, Md.

KOPPERS

FAST'S COUPLINGS

Engineered Products Sold with Service

SCIAKY ELECTRON BEAM WELDING

Here's how you can combine precision research and practical production electron beam welding in one equipment installation

Whether your interest in electron beam welding processes is for highly precise research or practical production work—or both—your data should be complete with details on Sciaky machines. They are most simple and practical in concept and operation.

GUN DESIGN GIVES EXCEPTIONAL ELECTRON OPTICS

The Sciaky Electron Gun produces specific beam density previously possible only with accelerating potential higher than 100,000 volts. The Sciaky gun, entirely contained within the atmosphere of the welding chamber, will operate in any angular position. *Both* gun and fixture can be moved to any position within the chamber while welding.

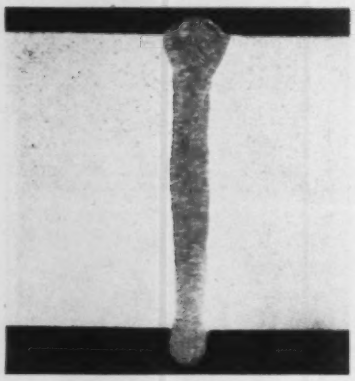


Figure 1

Advanced focusing design results in electron beam welds of 12 to 1 depth to width characteristics. Figure 1 shows a deep penetrating butt weld in type 304 stainless steel. Plate thickness is .5". Note lack of heat-affected zone.

GUN AN INDUSTRIAL TOOL

The gun construction is simple and rugged. Precise alignment is inherent in design, and is not dependent upon assembly adjustments. If necessary, filaments can be easily and quickly replaced in less than five minutes. As shown in Figure 2, the Sciaky Electron Beam Gun is small and

Figure 2

compact. A simple spacer arrangement optimizes gun optical system throughout a wide range of output power without compromise of specific beam energy. As a result, the

Figure 3

Sciaky gun is optimized at current ranges of 250, 150, 100 and 50 MA. at 30,000 volts. Output power is continuously adjustable within each range.

EFFICIENT PUMPING SYSTEM

Evacuation of chamber to welding pressure is obtained within 3 to 10 minutes, depending on chamber size. Pumping sequence is fully automatic, and without any manual adjustment. Automatic safety devices insure trouble-free operation and full protection of system.

RADIOLOGICAL HAZARDS ELIMINATED

Low voltage (30,000 v. maximum) and highly refined chamber design eliminate x-ray hazards to operator, which are a severe problem with higher voltage equipment. As a result, the Sciaky low voltage system needs no costly shielding, even when welding at highest output.

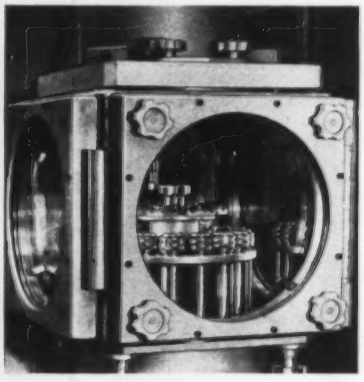


Figure 4

As shown in Figures 3 and 4, complete accessibility and visibility are provided by this latest Sciaky design. All sequence controls of the dial feed unit (Figure 4) are fully automatic. This production unit is being used to weld end-caps to tubes.

Regardless of your specific area of interest, you'll find the Sciaky combination of welding experience and electron beam technology is well advanced. Sciaky is Exclusive Licensee under Stohr, U.S. Patent 2,932,720.

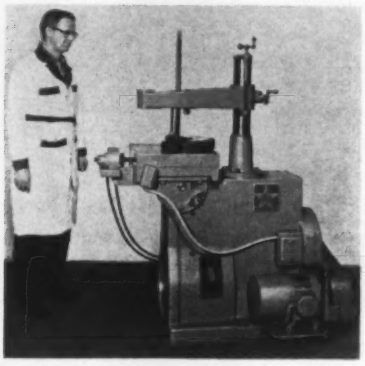
61C6192

You can learn more about Sciaky Electron Beam Welding, fully automatic TIG and MIG Welding with modular or building block concept, and the newest in Bench Welding at the

A.W.S. Welding Show, New York Coliseum, April 18, 19, 20,
Booth 729

SCIAKY BROS., INC., 4923 WEST 67th STREET, CHICAGO 38, ILLINOIS • PORTSMOUTH 7-5600

from ⅛- to 1¼-in. wide, wedge and lock in a cutter bar. The bar travels up and down. The work feeds in toward the cutter automat-

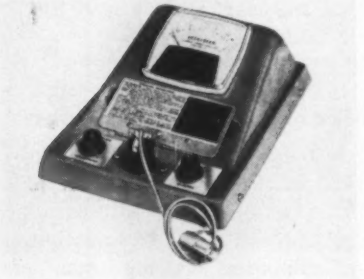


ically, when the cutter bar is at the top of its stroke. It backs out at the bottom of each stroke to clear the tool. (Star Cutter Co.)

For more data circle No. 53 on postcard, p. 115

Conductivity Meter

Compensating for liquid temperatures from 32°-212°F, a portable conductivity meter gages the solids content of liquids. It reads directly. Largely because of its printed transistorized circuit, the unit weighs only 2 lb. The meter operates on an ordinary 9-v transistor radio bat-



tery. It's good for field and laboratory use. A conversion scale converts ohms to micro ohms and ppm as sodium chloride. (Comroe Laboratories, Inc.)

For more data circle No. 54 on postcard, p. 115

Hydraulic Traverses

Electronically controlled, hydraulic traverses provide reciprocating linear motion. Velocity is uniform. Maximum length of stroke ranges from 48-144 in., depending on the model. The length and position of stroke is infinitely adjustable. Direct-reading counters indicate the position, length and speed of stroke. Speed of stroke adjusts from 0-240 fpm. Dwell at the end of each stroke can be controlled. Speed and length of stroke are adjustable during operation. (Jennings Machine Corp.)

For more data circle No. 55 on postcard, p. 115

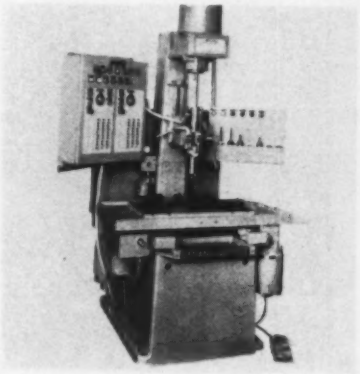
Micro Slicer

A unique slicer machine cuts costly metals into wafers as thin as 0.01 in. The micro slicer uses a new concept in slicing friable metals. First of all, it does not use a saw band. Instead, the slicer has a thin cutting wheel with an open center. Circling the inside opening of the wheel is a diamond cutting edge. The ingot of metal to be cut is positioned through the inner opening in the wheel. Slicing is done automatically. Cutting wheels are only 0.006 and 0.010 in. thick. These thin wheels reduce the amount of material lost during cutting operations. One application is the semiconductor industry. (The DoAll Co.)

For more data circle No. 56 on postcard, p. 115

Multi-Purpose Driller

Tape controls enable this versatile drilling machine to quickly convert to single-part, short-run or



production drilling. The numerical-control keyboard guides single part operation; or, the coordinates can be dialed on a console that mounts

WHEN YOU NEED HELP IN A HURRY—

Koppers coupling service cuts costly down-time

Not every coupling service need is an emergency. But it's the emergencies that really test a good organization. That's why Koppers maintains experienced field engineers and outstanding stock facilities throughout the country. In addition, if it's a Fast's Coupling you're replacing, we have a serial number and specific application history for every Fast's for easy reordering. And our modern manufacturing facilities have the extra capacity to lick an emergency for special requirements.

Example: A modern windowless bank in Georgia was able to open for business as usual only because Koppers flew in a completed replacement coupling for its air conditioning unit. Elapsed time . . . request phoned to Baltimore after 10 in the evening . . . coupling arrived before 7:30 next morning.

KOPPERS COMPANY, INC., 204 Scott St., Baltimore 3, Md.

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FAST'S COUPLINGS

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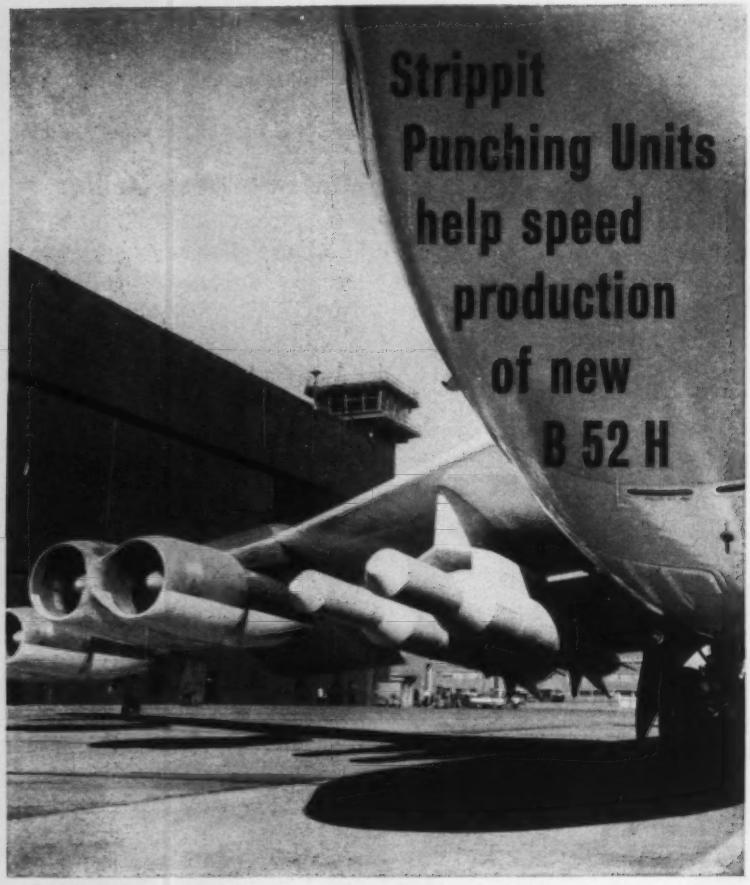
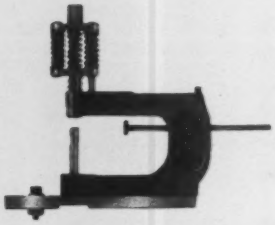




STRIPPIT self-contained units are the most efficient, most economical method of punching holes in metal. That's why Boeing Airplane Company has utilized thousands of them in the production tooling for the latest, most devastating version of the famous Stratofortress.

STRIPPIT Units consist of holders containing the punches, dies, stripping guides and stripping springs. Any good mechanic can quickly set up these units to punch the pattern of holes desired. The "C" Unit shown here, for instance, is ideal for close center-to-center rivet holes in wing and fuselage sections. This "C" Unit also features a pedestal die for punching holes in angles, channels, shapes and extrusions.

All STRIPPIT Units are independent, self-contained and self-stripping. They provide permanent alignment of punches and dies for precise hole positioning. There are a tremendous variety of STRIPPIT Units with capacities up to 3.5" hole diameters and ¾" thick material.

Find out how The STRIPPIT System can speed your production and cut your press "down-time" to a minimum. Write now for free catalog.

WALES **STRIPPIT** INC.
202 Buell Road • Akron, New York

HOUDAILLE INDUSTRIES INC.

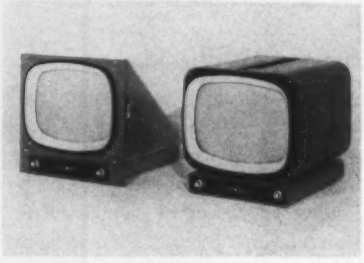
In Canada: Strippit Tool & Machine Company, Brampton, Ont.; In Continental Europe: Raskin, S. A., Lausanne, Switzerland; In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England.

on the drilling machine. Standard 8-channel punched tape, teamed up with a fast tape reader, does the control job for repetitive work. The program can include automatic reversal for tapping, and instant tool and speed changes. Tool-change lights flash the signals. (Leland-Gifford Co.)

For more data circle No. 57 on postcard, p. 115

Closed-Circuit TV

Aimed at filling the visual communications needs of industrial plants, a new series of closed-circuit television monitors features an expanded brightness range. They have three times the picture quality of home sets, but are simpler to maintain and adjust. They operate with any standard monochrome camera. The units can monitor a variety of



subjects such as: Hazard areas, gates, meters, processes, security areas and pipelines. (General Electric Co.)

For more data circle No. 58 on postcard, p. 115

Electric Angle Grinder

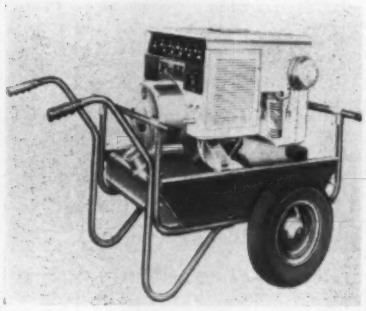
For the metal and allied industries, an electric angle grinder has high-speed operation. It trims castings and cuts risers, removes burrs and eliminates welding seams or minor projections on bodies or chassis. A 1.6-hp motor drives the grinder. Speed at no load is 6500 rpm. The grinder accommodates highly-flexible, resin-bonded and depressed-center grinding disks. (Victor J. Krieg, Inc.)

For more data circle No. 59 on postcard, p. 115

Does Double Duty

An engine-driven dc welder also serves as an ac power plant. Rated

at 200 amp, 50-pct duty cycle, the new unit delivers 3½-kw, 120-v, 60-cycle current for lighting and electric tools. It's powered by a 2-

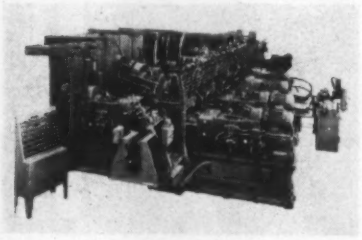


cylinder, 4-cycle, air-cooled gasoline engine, complete with 12-v electric starter. The heavy-duty generator has ac windings for auxiliary output, a cranking field and a battery-charging circuit. (Harnischfeger Corp.)

For more data circle No. 60 on postcard, p. 115

Drills Cylinder Heads

This machine, only 46-ft long by 17-ft wide, accepts heads from the last station of the previous machine, and deposits them at a forwarding index station for further processing. It drills, reams, chamfers, spotfaces, counterbores, core drills and taps holes in one continuous operation. Production rate is 103 heads per hr at 80-pct efficiency. Three of the 17 stations have a one-way unit. This leaves



the opposite side vacant for adding units in the future. The rest have two-way units. (The Foote-Burt Co.)

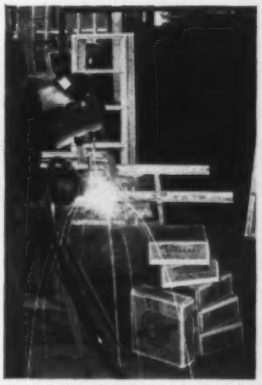
For more data circle No. 61 on postcard, p. 115

Detects Moisture

With its rapid detection of minute moisture changes, a new portable meter is useful in many control applications. It monitors gas in purge systems, gas dryers and pilot plants, measures trace quantities of mois-

SPOOLED WIRE

USE SPOOLARC®



Rapid fabrication of aluminum window frames by metal inert-gas welding requires trouble free aluminum wire. Philadelphia manufacturer increased his production with mirror-finish All-State SPOOLARC®

for porosity-free welds... constant arc... better control ...fewer errors... faster work

Aluminum wire in all tempers now available in mirror finish, oil-free, precision layer wound spools. ALL-STATE's cleaning and tension controlled winding method produces wire free from helix (twist), permitting welds that do not walk.

Aluminum SPOOLARC® is packaged with desiccant in sealed plastic bags to eliminate moisture, a common cause of porosity in welds.

OTHER METALS—silicon bronze, deoxidized copper, aluminum bronze, phosphor bronze, magnesium, and nickel. Available in SPOOLARC® form. For more information on SPOOLARC® and other ALL-STATE products, send for free 56-page Instruction Manual and SPOOLARC® literature.

Available from distributors everywhere.

All-State

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White Plains, N.Y. Dial 914 WH 8-4646
QUALITY WITH SERVICE

We bet millions on our couplings

When you buy a Fast's coupling, you can bet your bottom dollar everything was built on the spot, not assembled piece by piece from other suppliers. Koppers multi-million dollar manufacturing facilities are the most modern in the industry . . . with advanced program machines, highly accurate gear shapers, a complete forge shop.

For example, all Fast's Couplings are jig-drilled and jig-reamed for greater interchangeability of parts. Result: you get high-quality, smooth-running, long-lived units that are the choice of more equipment manufacturers than any other gear-type coupling.

KOPPERS COMPANY, INC., 204 Scott Street, Baltimore 3, Md.

KOPPERS®

FAST'S COUPLINGS

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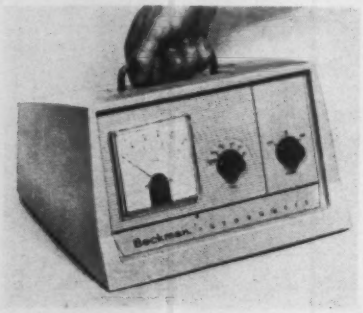
ture in helium, checks water content in bottled gases. Weighing only 11 lb, the moisture meter has a rugged plastic case, with a built-in carry-



ing handle. It operates either from ac power or with the battery power supply included in the instrument. (Beckman Scientific and Process Instruments Div.)

For more data circle No. 62 on postcard, p. 115

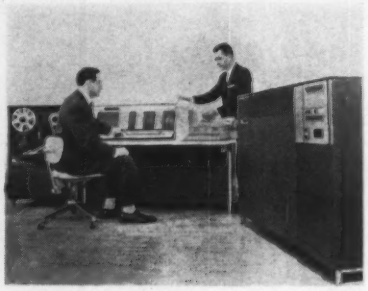
Conveys Powders

A new method to convey dry, powder-like materials through an enclosed piping system uses a pump to replace blowers, ducts and dust collectors. Performance capacities to date have ranged as high as 24,000 pounds per hour. The system functions well in runs up to 200 ft and it can lift more than 75 ft. Like a piston moving through a cylinder of infinite length, its performance is smooth and free from turbulence with a uniform flow suitable for metering purposes. (Robbins & Myers, Inc.)

For more data circle No. 63 on postcard, p. 115

Controls Operations

A new data converter automatically scans as many as 300 instruments connected to an industrial process or operation. Then, it feeds the information in digital form to a solid-state computing unit for evaluation. It reads out instructions for adjusting control settings or information indicating flaws in manufacturing operations. Or, it prints this data on the console typewriter. The converter may be located away from the computing unit. In addition, the computing unit operates independently of the converter to solve engineering and technical business

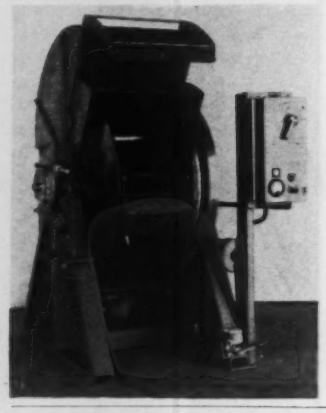


problems. (International Business Machines Corp.)

For more data circle No. 64 on postcard, p. 115

Overhead Cranes

For regular industrial service, a new line of overhead electric traveling cranes offers a choice of lifts, speeds and electrical currents. They're available in capacities ranging from 3 to 25 tons, spans to 80 ft and come equipped for floor or cab operation. Because of their compact, low-silhouette trolley design, the cranes permit maximum use of



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Listen...

5...4...3...2...1...0...Lift Off!

The countdown is on.

Scientists and skilled technicians scan their instruments, alert to the least sign of malfunction.

Liquid oxygen has been piped into the fuel chamber of the gleaming Atlas ICBM poised on the launching pad. Other last-minute preparations are completed.

Tension mounts. It won't be long. Listen . . .

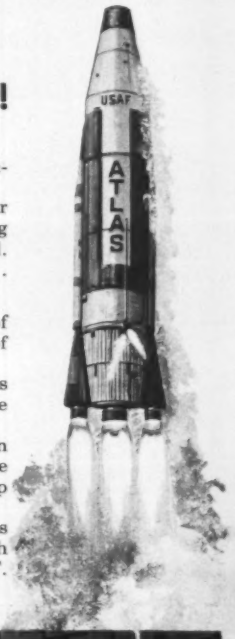
5...4...3...2...1...0...*Lift Off!*

The missile comes to life in a swirling cloud of vapor, exhaust and flame. The engine—capable of 360,000 pounds of thrust—roars thunderously.

Airborne now, the Atlas gathers speed and soars majestically on its predetermined course down the Atlantic range—a successful launching.

Jessop Steel Company makes several alloys used in the Atlas—steels forged and machined into precise but rugged mechanisms. And you will find Jessop steel in the launching pad "plumbing" too.

Swepco Tube Corporation of Clifton, N. J., makes piping for LOX systems that fuel the Atlas with liquid oxygen at temperatures of –300° F. to –320° F. *That's* punishment for any metal.



But Swepco's austenitic chromium nickel Rock-Forged pipe can take it. Ductility—to avoid fracture by reason of brittleness—is an all-important factor in this application.

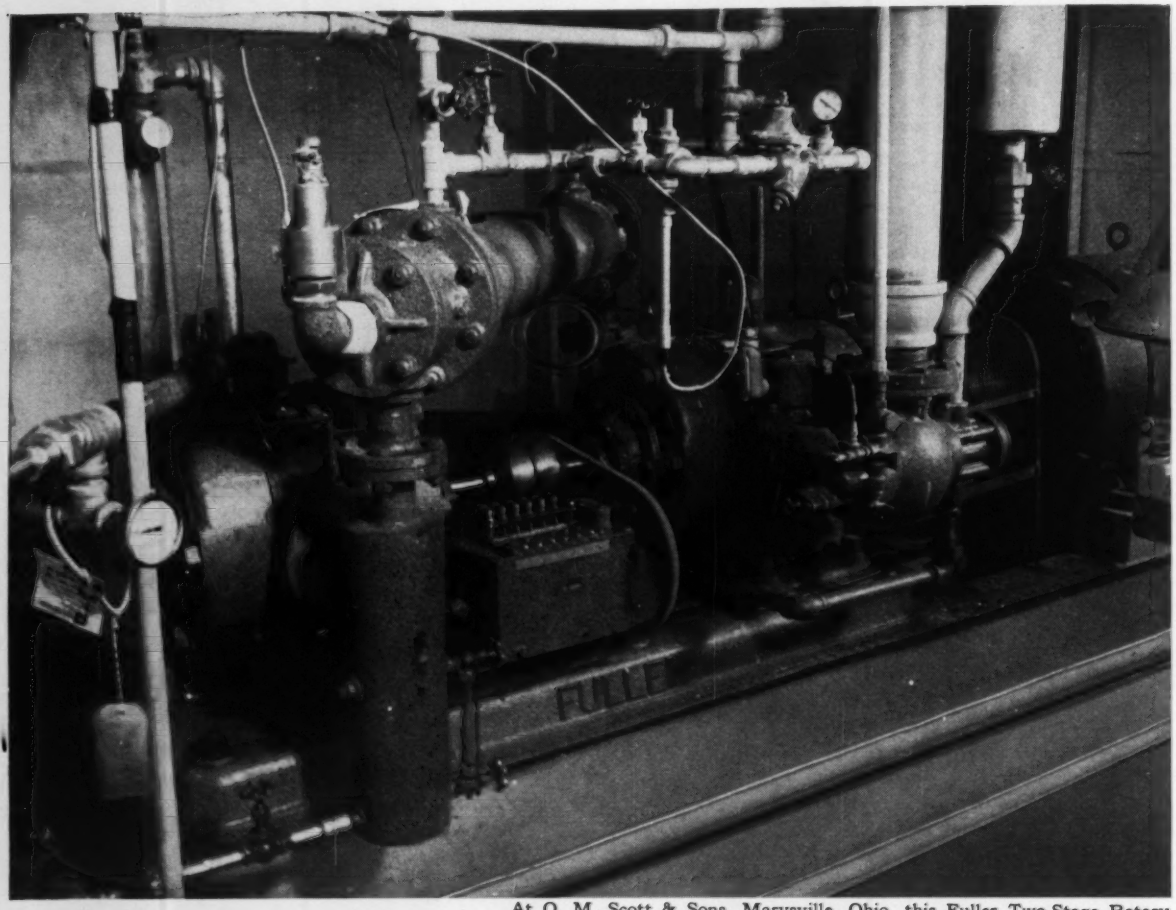
With a value of about 38 foot pounds by Charpy Impact Test, the piping supplied by Swepco handles the job with ease—with an added measure of safety against costly breakdown.

Swepco buys steel from Jessop for rock-forging. Why? Because through controlled chemistry and certain production techniques, Jessop and Swepco developed a steel second to none in workability in the cold forging process.

In making steel like this, experience counts . . . and Jessop has it. Call any of Jessop's 23 sales offices in North America and let us prove it to you.

Plants and Service Centers:
Washington, Pa. • Los Angeles • Chicago • Detroit • Owensboro, Ky. • Wallaceburg, Ont.

JESSOP



At O. M. Scott & Sons, Marysville, Ohio, this Fuller Two-Stage Rotary Compressor with overhead intercooler and 60 hp motor has operated 24 hours a day straight through for one year, without downtime or maintenance.

No Air Starvation with a Fuller Compressor in the Packhouse

Maintenance Supervisor Alfred Asman of O. M. Scott & Sons, Marysville, Ohio, has high praise for their Fuller compressor: "Before we had the Fuller, we regularly had complaints of low air pressure. Since the Fuller is supplying all the packhouse air requirements, no one has complained of lack of air."

Their Fuller Rotary Two-Stage Compressor unit with overhead intercooler, producing 281 cfm, 100 lb. gage discharge pressure, has operated 24 hours a day straight through for one year—without even a sign of blade or bearing wear.

Reliable performance and dependable delivery of air, when and where needed, is only part of the story. Scott & Sons, along with others using Fuller Rotary Compressors, know that only minor maintenance of parts is all that is necessary for years to come—creating savings in labor, downtime and materials.

The key is Fuller's rotary principle which permits a design completely free of reciprocating parts. Elimination of valves, crankshafts, pistons and other moving parts cuts the need for attention, adjustment and replacement. Blades are "held" to cylinder wall by centrifugal force—automatically compensating for wear—thus maintaining new machine efficiency.

What's more, compact, easily installed Fuller Rotary Compressors are vibration-free, further reducing costs by eliminating the need for involved and expensive foundations.

A Fuller specialist will gladly discuss your compressor needs and suggest a system geared exactly to your specific situation. Write for Bulletin C5-A today or contact Fuller on your plant requirements.

2561
C360

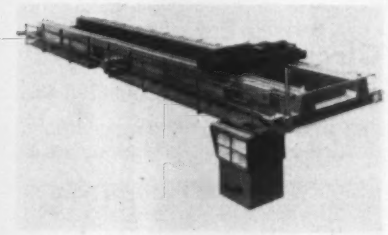
See Chemical Engineering Catalog for further details and specifications.

FULLER COMPANY
GENERAL AMERICAN
TRADE MARK

FULLER COMPANY
122 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
....pioneers in harnessing AIR

building or bay area. Another similar advantage is their ability to place the load hook close to the

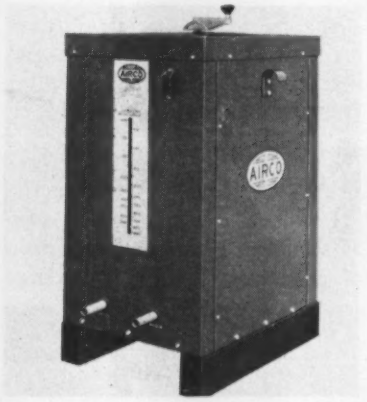


building walls. This means nearly every foot of floor space is accessible to the crane. (Manning, Maxwell & Moore, Inc.)

For more data circle No. 65 on postcard, p. 115

Welds Heavy Work

Employing a transformer with a movable-coil design, these industrial welders are simple, rugged and inexpensive. The mechanical coil insures dependable performance, plus stepless control of welding current and good arc response. Eliminating magnetic-arc blow permits the use of larger electrodes and higher heat



values for more efficient welding. The new series of heavy-duty arc welders does ac manual and automatic-production welding. (Air Reduction Co., Inc.)

For more data circle No. 66 on postcard, p. 115

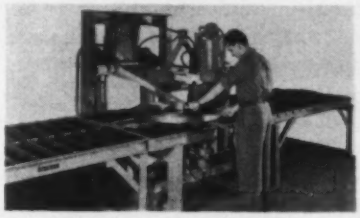
Wire Drawing Machine

Arranged with independent motor drives, a line of multiple wire drawing machines suits low-torsion and non-twist drawing of wire. The individual motors are mounted below or behind each block. Each vertical capstan can be independently driven. Automatic controls set the unit into operation. The machine incorporates rapid stopping features in case of wire breakage or accidents. (Straus-Artys Corp.)

For more data circle No. 67 on postcard, p. 115

Strapping Unit

A semi-automatic strapping station for narrow strip coils, has its machine head mounted above a roller conveyor table and supported by counter-balanced arms. This suspension system allows fingertip po-

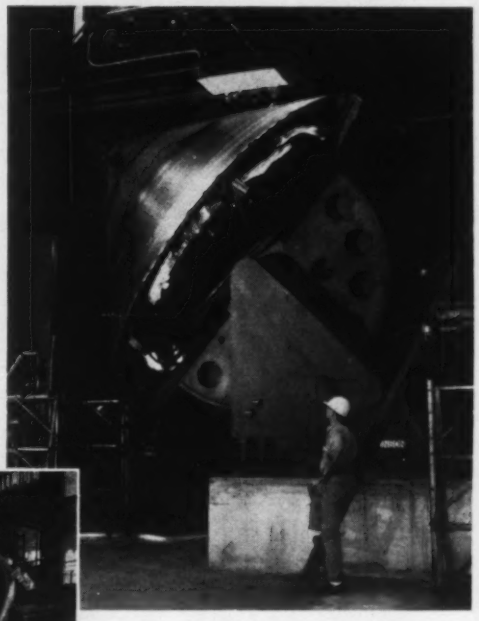


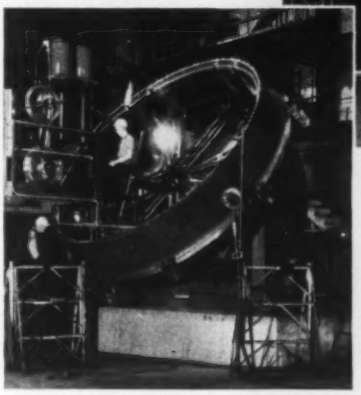
sitioning with the machine. A force of only 3½ lb on the adjusting handle positions the unit anywhere in

PROFITS are built on DEPENDABILITY

ARONSON Model G3500 "EXCALIBUR" Gear Driven Positioner is used by a large Eastern steel producer for hard-facing bell hoppers for blast furnaces. "EXCALIBUR" provides the greatest precision and economy in the handling of large workpieces.

"EXCALIBUR" is not a special job machine, but a Positioner that will handle 90% of those jobs you now wrestle around the shop floor with profit eating cranes.





"Excalibur" opens production doors that are closed to your competitors. "Excalibur" has been designed to handle almost every kind of weldment up to 175 tons at lowest possible shop cost — with the dependability that profits are built on.

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. . . WITH CAPACITIES RANGING FROM 25 POUNDS TO 600 TONS
Universal Balance® Positioners • Bench Turntable Positioners • Gear Driven Positioners
Headstock-Tailstock Positioners • TracTred® Turning Rolls • Turntables
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Write for detailed engineering data

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its 21-in. vertical range and 14 in. horizontal travel. The unit will place any number of radial straps on coils as large as 60 in.-O D, 24 in.-I D, and 16 in. wide, as small as 19 in.-O D, 13 in.-I D, and ⅜ in. wide. The maximum coil weight handled is 4000 lb. (Signode Steel Strapping Co.)

For more data circle No. 68 on postcard, p. 115

Box Furnaces

A line of controlled-atmosphere box furnaces consists of large and small units. The smaller units maintain temperatures of 2400°F. The larger units are capable of temperatures to 2250°F. Since the charge is heated by 100-pct forced convection, the units maintain good temperature uniformity. The furnaces come as gas fired, oil fired or electrically-heated units. They can be manually charged or used with mechanized loaders and unloaders. The latter use is for production-line heat treating operations. (Ipsen Industries, Inc.)

For more data circle No. 69 on postcard, p. 115

Circuit Breakers

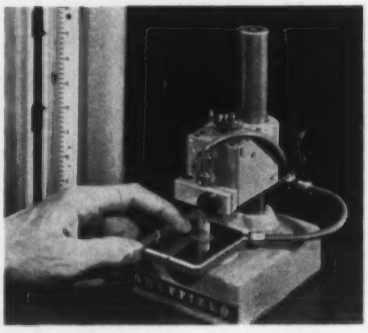
Without sacrificing quality, the new 800-amp model in a line of molded-case circuit breakers gives a

one-third saving in panel space. It comes in 2- and 3-pole types with current ratings of 125-800 amp for 600-v ac and 250-v ac. Easier handling and installation result from the breaker's reduced weight and size. (I-T-E Circuit Breaker Co.)

For more data circle No. 70 on postcard, p. 115

Non-Contact Gage

For thin, fragile materials such as semiconductor wafers and disks of germanium and silicon, a new



unit literally floats the part in air, during the measurement. Pressure-free gaging is obtained by means of opposed airjets; one in the head and the other in the anvil. Air, flow-

Weld 50% faster than ordinary methods...

- Eliminate costly cleanup after welding.
- Eliminate electrode changing and stub end loss.
- Weld light gauge metal with small diameter wire.
- Weld wide joint gaps approximately twice the base metal thickness.
- Produce smooth, clean, uniform welds.
- Use inexpensive shielding gases.
- Easy to use by inexperienced as well as experienced weldors.
- Easy handling lightweight waterless gun.

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"Manufacturers of the world's most complete line of arc welding equipment."

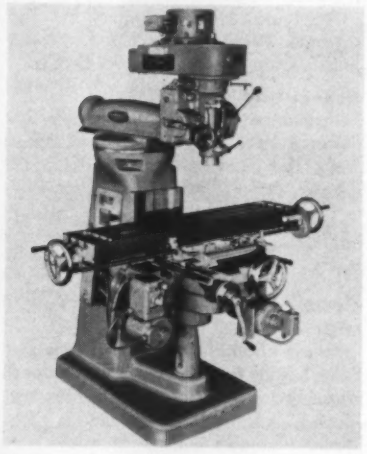
ing out of the jets, calipers the part. The position of a float in a column gives accurate, repeatable thickness measurements. (The Sheffield Corp.)
For more data circle No. 71 on postcard, p. 115

Stack Mist Separator

Chemical plants are often the victims of law suits because of damages caused by escaping acid mists. A new wire-mesh, entrainment separator reduces mist concentration to less than 1 mg of acid per cu ft of air. Pressure drop is less than 3 in. of water. An added bonus: The unit recovers acid mists that were blown out the stack. Savings are made on recovered acid and reduced maintenance of plant equipment. (Carpenter Steel Co.)
For more data circle No. 72 on postcard, p. 115

Ram and Turret Mill

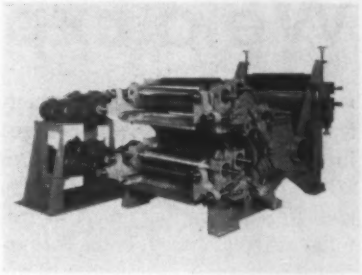
The head tilts 45° forward and back on a new ram and turret mill designed for tool-room use or production runs. The head also rotates 360° on the ram. In addition, the machine's turret rotates all the way around on the column, and the power assembly travels a full circle around the spindle. These features, plus 18-in. knee travel and 25½-in. overarm travel, simplify setups and provide for quick setting of any compound work angle. All this adds up to a machine with exceptional range for its class. (Index Machine Co.)



For more data circle No. 73 on postcard, p. 115

Coats Strip Material

This precision coater applies alkyds, acrylics and vinyls to narrow strips, 1- to 2½-in. wide. It handles a range of 10- to 90-pct solvents. Strip thicknesses should be from 0.010-0.030 in. for best results. (Midland-Ross Corp.)



For more data circle No. 74 on postcard, p. 115

Low Pressure Tanks

Spraying, pressure or vacuum impregnating, and conveying melted compounds are principal uses of electrically-heated, low-pressure tanks. Often used when gravity flow is not possible or when pumping costs are prohibitive, these tanks deliver a smooth flow of thick material. Low concentration and even distribution of heat stops hot-spots. This is achieved by specially-wound, heating elements evenly applied in multiple circuits around the bottom and sides of the tank. (Sta-Warm Electric Co.)
For more data circle No. 75 on postcard, p. 115

Swing Lathe

A 14 in. swing lathe features a variable speed drive of 40-1400 rpm. This provides instant speed adjustment without shifting the drive belt. Other features include 14⅝-in. swing over beds, 9 in. swing over saddle cross, and two precision ground V-ways and flat ways. The unit's hardened, ground steel spindle has a 1⅜ in. hole and a draw-in collet capacity of 1 1/16 in. The spindle turns on four scaled and shielded precision ball bearings. The lathe bed is braced by oversize ribs to withstand heavy stresses. (Logan Engineering Co.)
For more data circle No. 76 on postcard, p. 115

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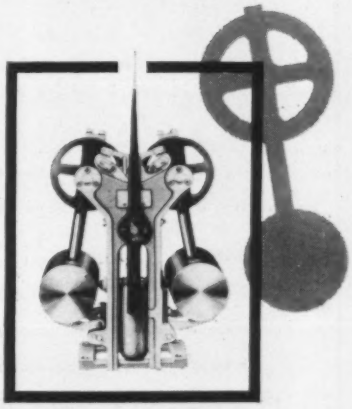

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Weld Experts Gather

■ Members and guests of the American Welding Society will convene in the New York Coliseum, April 10 to 21, for their annual Meeting and Welding Exposition. Also featured at the Coliseum is the concurrent 1961 Annual Assembly of the International Institute of Welding.

The AWS schedule includes a full complement of social events. On the informative side, two educational talks are scheduled, as well as 22 technical sessions with 66 lectures. A discussion period winds up each of the technical talks.

The program follows:

Processes, Mon., April 17

Starts at 2:00 p.m.

Notes on the Appreciation of Brazing Filler Metals and Fluxes, by C. G. Keel, Switzerland, G. M. A. Blanc, Switzerland and J. Colbus, West Germany.

Starts at 2:50 p.m.

Gas Mixtures in Shielded-Arc Welding with Consumable Electrode, by M. M. Komers, West Germany and L. Wolff, West Germany.

Starts at 3:40 p.m.

The Solutions Adopted in Some Difficult Applications of Flash Welding, by M. E. Bylin, Sweden.

Welded Structures,

Mon., April 17

Starts at 2:00 p.m.

Modern Welded Design of Multistory Structures, by Omer W. Blodgett, The Lincoln Electric Co.

Starts at 2:50 p.m.

Fatigue Behavior of Welded Joints in Reinforcing Bars for Concrete, by W. W. Sanders, Jr., P. G. Hoadley and W. H. Munse, University of Illinois.

Starts at 3:40 p.m.

Residual Stresses in Welded Plates, by N. R. Nagaraja Rao and Lambert Tall, Lehigh University.

Alloy Fabrication,

Mon., April 17

Starts at 2:00 p.m.

Fusion and Resistance Welding of Columbium Alloys, by W. R. Young, General Electric Co.

Starts at 2:50 p.m.

Heat Treatment and Welding Characteristics of B120VCA Titanium-Alloy Sheet, by John F. Rudy, Frank A. Crossley and Harry Schwartzbart, Armour Research Foundation.

Starts at 3:40 p.m.

Welded Rocket Cases Are Reliable at 200,000 psi Yield Strength, by E. J. Wilson, Jr., Redstone Arsenal.

Educational Lecture,

Mon., April 17

Starts at 4:30 p.m.

Heat Sources, Heat Flow and Heat Effects in Welding, by N. N. Rykalin, USSR (Part I).

Resistance Welding,

Tues., April 18

Starts at 9:30 a.m.

Applying Static Control to Resistance Welding, by C. F. Meyer and W. J. Brown, Square D Co.

Starts at 10:20 a.m.

Instrumentation in Automotive Resistance Welding, by Edward J. Zulinski, The Ford Motor Co.

Starts at 11:10 a.m.

Load Control for Resistance Welding, by R. E. Rogers, Instrument Control Co.

Brazing, Tues., April 18

Starts at 9:30 a.m.

Grain-Boundary Penetration and Base Metal Erosion in High-Temperature Brazing, by Nikolajs Bredzs and Harry Schwartzbart, Armour Research Foundation.

Starts at 10:20 a.m.

Brazing Ultra-High Strength Steel for Missiles, by Melvin J. Albom and R. E. Anderson, Aerojet General Corp.

Starts at 11:10 a.m.

Brazing of Sandwich Structures of Columbium Alloys, by Mel M. Schwartz, Martin Co.

Arc Welding,

Tues., April 18

Starts at 9:30 a.m.

Dip-Transfer Welding of High-Pressure Pipe, by W. W. Walker, Air Reduction Sales Co.

Starts at 10:20 a.m.

Automatic Arc-Welding Process for Field Welding Steel Pipelines, by J. H. Nelson, G. E. Faulkner and P. J. Rieppel, Battelle Memorial Institute, and H. C. Cook, Esso Research and Engineering Co.

Starts at 11:10 a.m.

Semiautomatic Vapor - Shielded Welding: A New Process, by R. A. Wilson, The Lincoln Electric Co.

Arc Welding,

Tues., April 18

Starts at 2:00 p.m.

Electrical and Metallurgical Factors Influencing Welding-Arc Stability, by Jerry E. Ginn, Boeing Airplane Co.

Starts at 2:50 p.m.

Wave Shape Effect on Alloying and Arc Stability of Alternating Current Tungsten Inert-Arc Welding, by Thomas B. Correy, General Electric Co.

Starts at 3:40 p.m.

Some New Concepts in Power Supplies and Arc Initiation Applied to TIG Spot Welding, by Marcel Sommeria, Sciaky Bros., Inc.

Brazing, Tues., April 18

Starts at 2:00 p.m.

Exothermic Brazing, by Roger A. Long, Narmco Industries, Inc.

Starts at 2:50 p.m.

Argon Brazing of Difficult-To-Braze Metals, by J. W. Hill, Linde Co.

Starts at 3:40 p.m.

Eutectic Brazing of Zircaloy-2 to Type 304 Stainless Steel, by W. A. Owczarski, General Electric Co.

Applications, Tues., April 18

Starts at 2:00 p.m.

A Welded, Tubular-Bucketed Turbine Wheel, by E. J. Clark, General Electric Co.

Starts at 2:50 p.m.

New Method of Backing Double-V Weld Joints in Steel Plate, by J. N. Cordea, R. M. Evans and P. J. Rieppel, Battelle Memorial Institute.

Starts at 3:40 p.m.

Creative Architectural Design with Welded Space Structures, by M. P. Korn, Consulting Engineer.

Educational Lecture,

Tues., April 18

Starts at 4:30 p.m.

Heat Sources, Heat Flow and Heat Effects in Welding, by N. N. Rykalin, USSR (Part II).

Welded Structures,

Wed., April 19

Starts at 9:30 a.m.

Determination of the Fatigue Limit

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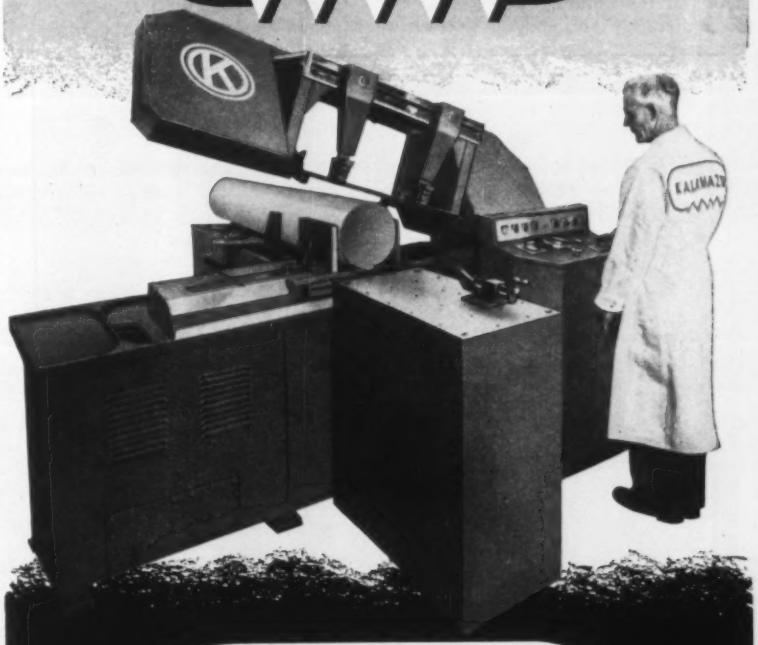

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Now, after more than four years' research, Kalamazoo brings to you the all new Model 14A — horizontal metal cutting bandsaw. Incorporating some 30 shop proven, cost saving features, this hydraulic driven, heavy duty bandsaw offers cutting capacity and ability in excess of any cut-off method, at far less tool cost per square inch of cutting.

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MACHINE TOOL DIVISION
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by Means of a Single Welded Specimen or Assembly, by M. R. Cazaud, France.

Starts at 10:20 a.m.

The Calculation of Welded Connections, by A. Van Douwen, The Netherlands.

Starts at 11:10 a.m.

Pressure Vessel Design Requirements in the Future, by W. B. Carlson, United Kingdom.

Arc Welding, Wed., April 19

Starts at 9:30 a.m.

A Double-Taper Tungsten-Arc Welding Control, by Austin Dixon, Westinghouse Electric Corp.

Starts at 10:20 a.m.

Special Equipment for Low-Current Metal-Arc Welding, by W. J. Greene, A. Lesnewich and N. E. Anderson, Air Reduction Co.

Starts at 11:10 a.m.

Development of a Power Supply for Stored-Energy Arc Welding, by Cecil C. Stone and Robert A. Noland, Argonne National Laboratory.

Weldability, Wed., April 19

Starts at 2:00 p.m.

The Role of Hydrogen in Arc Welding with Covered Electrodes, by N. Christensen, Norway.

Starts at 2:50 p.m.

Influence of Residual Stresses and Metallurgical Changes on Low-Stress Brittle Fractures in Welded Steel Plates, by A. A. Wells, United Kingdom.

Starts at 3:40 p.m.

Inspection and Measurements of Properties of Welds on Plastics, by G. A. Homes, Belgium.

Resistance Welding, Wed., April 19

Starts at 2:00 p.m.

Fatigue Testing Resistance-Spot Welds in Shear, by E. E. Weismantel and D. S. Kalbfleisch, The Budd Co.

Starts at 2:50 p.m.

Properties of Flash-Welded Molybdenum, by E. G. Thompson and H. Binder, The Marquardt Corp., and H. Collins, Dresser Mfg. Div.

Starts at 3:40 p.m.

Inserted-Shim Projection Welding of a Continuous Rod Mat, by Keh-Chang Wu and R. E. Lewis, Watervliet Arsenal.

Panel Discussion, Wed., April 19

Starts at 2:00 p.m.

Missiles and Rockets — Welded Fabrication, Moderator: D. B. Howard, ACF Industries, Inc.

Electroslag Welding Thurs., April 20

Starts at 9:30 a.m.

Electroslag Welding in West European Countries — Improvement and Applications, by F. G. Danhier, Belgium.

Starts at 10:20 a.m.

Electroslag Welding of Very Thick Materials, by B. E. Paton, USSR.

Research and Weldability, Thurs., April 20

Starts at 9:30 a.m.

A New Technique for Studying Residual Stresses, by D. C. Martin and Koichi Mas-Ubuchi, Battelle Memorial Institute.

Starts at 10:20 a.m.

The Cruciform Test for Plate-Cracking Susceptibility, II, by W. P. Hatch, Jr., Watertown Arsenal Laboratories, and L. E. Poteat, North Carolina State College.

Starts at 11:10 a.m.

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Arc-Spot Welding,

Thurs., April 20
Starts at 9:30 a.m.

Consumable-Electrode Spot Welding, by J. A. Howery and G. F. Mack, National Cylinder Gas Co.

Starts at 10:20 a.m.

Gas-Shielded-Arc Consumable-Electrode Spot Welding in Industry, by R. P. Sullivan, Linde Co.

Starts at 11:10 a.m.

Semiautomatic Tungsten-Arc Spot Welding of Stainless Steels and High-Temperature Alloys, by R. J. Campbell and D. R. Miller, General Electric Co.

Processes, Thurs., April 20

Starts at 2:00 p.m.

New Concepts for Oxygen Cutting, by C. C. Anthes, Linde Co.

Starts at 2:50 p.m.

Advances in Electron-Beam Welding Techniques, by Robert R. Banks, Air Reduction Sales Co.

Starts at 3:40 p.m.

Ultrasonic Welding, Engineering, Manufacturing and Quality Control Problems, by J. Koziarski, The Martin Co.

Nuclear Components,

Thurs., April 20
Starts at 2:00 p.m.

Inconel Deposited Weld Metal for Nuclear-Component Parts, by R. W. Minga and W. H. Richardson, Combustion Engineering, Inc.

Starts at 2:50 p.m.

Insulation Attachment by Welding for an Aircraft Nuclear Propulsion Powerplant, by R. J. Campbell and T. D. McLay, General Electric Co.

Starts at 3:40 p.m.

The Brazing of Graphite, by R. G. Donnelly and G. M. Slaughter, Oak Ridge National Laboratory.

Research and Weldability,

Thurs., April 20
Starts at 2:00 p.m.

Transition-Temperature Correlations in Constructional Alloy Steels, by G. M. Orner and D. E. Hartbower, Watertown Arsenal Laboratories.

Starts at 2:50 p.m.

The Yield Strength of E9018 Weld Metal, by W. L. Wilcox and H. C. Campbell, Arcos Corp.

Starts at 3:40 p.m.

Ferritic Welding of Steel Armor, by Z. J. Fabrykowski, U. S. Army Ordnance Tank-Automotive Command.

Submerged-Arc Welding,

Fri., April 21
Starts at 9:30 a.m.

Observations on Electrode-Melting Rates During Submerged-Arc Welding, by Michael H. Robinson, ACF Industries, Inc.

Starts at 10:20 a.m.

Advancements in Submerged-Arc Welding of High-Impact Steels, by R. A. Kubli and W. B. Sharav, Linde Co.

Starts at 11:10 a.m.

Flux and Filler-Wire Developments for Submerged-Arc Welding HY-80 Steel, by Wallace J. Lewis, G. E. Faulkner and P. J. Rieppel, Battelle Memorial Institute.

Gas-Shielded Welding,

Fri., April 21
Starts at 9:30 a.m.

Some Metallurgical Aspects of CO_2 Shielded-Arc Welding, by M. D. Randall and P. J. Rieppel, Bat-

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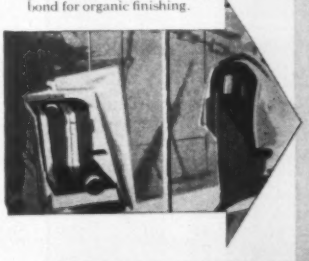

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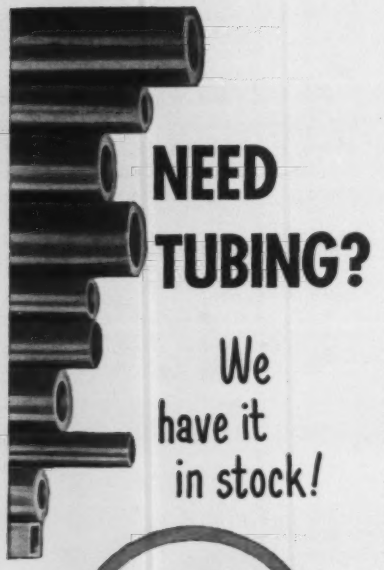

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SHOW PROGRAM

telle Memorial Institute.

Starts at 10:20 a.m.

Argon - Shielded Alternating-Current Metal-Arc Welding, by C. R. Sibley, Air Reduction Sales Co.

Starts at 11:10 a.m.

Co_2-Shielded Welding Horizontal Joints of Oil Storage Tanks, by Paul W. Turner, Union Carbide Nuclear Co.

Research and Weldability,

Fri., April 21

Starts at 9:30 a.m.

Welding of 12-pct Chromium Martensitic Stainless Steels, by C. H. Kreischer, A. E. Near and J. Cothren, General Electric Co.

Starts at 10:20 a.m.

Lime - Coated Versus Titania - Coated Stainless - Steel Electrodes, by B. S. Payne, Jr., G. J. Dormer and L. R. Haslip, Pfaudler-Permutit, Inc.

Starts at 11:10 a.m.

Effects of Repeated Repair Welding of Two Aluminum Alloys, by F. G. Nelson, Aluminum Co. of America.

SHOW EXHIBITORS

Exhibitor	Booth
Airline Welding & Engineering	706
Air Reduction Sales Co.	320
Alloy Rods Co.	601
All State Welding Alloys Co., Inc.	529
Alphil Spot Welder Mfg. Corp.	717
Aluminum Co. of America	631
American Machine & Foundry Co.	209
American Pullmax Co., Inc.	200
Arcair Co.	727
Arcos Corp.	521
Arc Spot Welder Corp.	612
Aronson Machine Co.	700
Balteau Electric Corp.	531
Bay State Abrasive Products Co.	501
Bernard Welding Equipment Co.	220
Bren Weld Corp.	400
Brunmar Commercial Corp.	110
Cam-Lok Div., Empire Products, Inc.	221
Coast Metals, Inc.	202
Cosa Corp.	300
Coyne Cylinder Co.	228
Dockson Corp.	703
Earth Equipment Corp.	707
The Emerson Electric Mfg. Co.	713
Engelhard Industries, Inc.	712
Eutectic Welding Alloys Corp.	134
Exomet, Inc.	124
Faltsrom Co.	711
Fibre-Metal Products Co.	616
Frommelt Industries	117A
General Dynamics Corp.	304
General Electric Co.	404
Glendale Optical Co., Inc.	507
Gregory Industries, Inc.	237
Handy & Harman	312
Harnischfeger Corp.	617
Harris Calorific Co.	634
Harper Trucks, Inc.	629
Hobart Brothers Co.	315
Independent Engineering Co., Inc.	602
International Nickel Co., Inc.	217
Jackson Products, div. Air Reduction Co., Inc.	332
Kaiser Corp.	705
K S M Products, Inc.	433
Lennox Tool & Machine Builders	123
The Lincoln Electric Co.	520
Linde Company, div. of Union Carbide Corp.	421
Magnaflux Corp.	715
Marindus Co.	709
Markal Co.	625
Marquette Manufacturing Co.	714
The McKay Co.	222
Messer Cutting Machines, Inc.	504
Metal & Thermit Corp.	619
Metallizing Co. of America	126
Metco, Inc.	536
Mid-States Welder Mfg. Co.	233
Miller Electric Mfg. Co., Inc.	509
Milwaukee Electric Tool Corp.	201
Modern Engineering Co.	600
National Cylinder Gas, div. of Chemetron Corp.	436
National Electronics, Inc.	119
National Torch Tip Co.	336
Omark Industries, Inc.	301
Page Steel & Wire Div., American Chain & Cable Co., Inc.	402
Pandjiris Weldment Co.	420
Phillips Electronics, Inc.	213
Picker X-Ray Corp.	216
Precision Welder & Flexopress Corp.	726
J. M. Ragle Industries, Inc.	230
Ransome Co.	305
Reid Avery Co.	525
Robotron Corp.	212
Robvon Backing Ring Co.	232
Sciaky Bros., Inc.	729
Secheron Works Co.	203
Sellstrom Mfg. Co.	638
Simonds Abrasive Co.	208
Singer Glove Mfg. Co.	101
A. O. Smith Corp.	532
Sperry Products Co., div. of Howe Sound Co.	718
Square D. Co.	505
Steffan Mfg. Corp.	100
Stoody Co.	424
Sylvania Electric Products, Inc.	114
Tec Torch Co., Inc.	316
Tempil Corp.	528
Thomson Electric Welder Co.	732
Toyomenka, Inc.	537
Tweco Products, Inc.	627
Uniflex Cable Div., Gar Wood Industries, Inc.	108
Unique Equipment Inc.	514
Victor Equipment Co.	604
Wall Colmonoy Corp.	236
Welding Alloys Mfg. Co.	111
Weld Tooling Corp.	739
Welduction Corp.	104
Welsh Manufacturing Co.	533
Weltronic Co.	609
Wespo Div.	132
Westinghouse Electric Corp.	333
Wheelabrator Corp.	613

April Shipments to Move Up

A flurry of new orders in the last days of March and early April indicate a 5 pct climb in shipments.

Result: A lengthening of lead time, some advance ordering.

■ Shipments of steel in April will be at least 5 pct better than March. The industry's slow, and hard, recovery resumed with a brisk flurry of orders in the last days of March and into April.

Up to then, April bookings had lagged to the point where they were no better than a month ago. In fact, some doubts had been expressed of further gains this month.

The pattern of improvement varies by mill and product. Over the last six days, one major mill received orders at a rate equal to 75 pct of capacity. The mill does not expect this to last, but the flurry reflects the sudden stops and starts that characterize the current market.

What to Expect—As a result of the better orders placed in the past week this is what can be expected in April:

A gain of 5 pct in shipments. With fewer shipping days, the daily rate will move up a bit faster.

Mill schedules for some products are filling up and deliveries are lengthening.

Customers are starting to order three to four weeks ahead for some products. While this is not a long lead time by former standards, it shows a stabilizing of the market and indicates a continued uptrend.

Sheets Pick Up — Flat-rolled products are leading the way. Tinplate is strong. Galvanized demand is increasing. Both hot and cold-rolled sheets are picking up. The significant thing here is that the sheet market is firming without new support coming from automotive.

In Detroit, some pickups of automotive production schedules are expected, but any real support for the steel market depends on an upsurge of auto sales. At the moment, inventories of unsold cars are still too high to count on a resurgence in demand from Detroit.

Cautious estimates of April production range from 420,000 to 440,000. This compares with a little better than 400,000 made in March.

Closing Out 1961's — Looking ahead, automakers will place their last orders for 1961 model steel in June, but little will be ordered for that month. Some orders for 1962 models will start showing up in late June.

Automakers will now start placing their orders close-to-the-vest as they start planning for shutdowns. They are now carrying only 20 to 30 days of inventory in typical cases, but will be even more cautious about steel stocks as the model year draws to a close.

Price Action—Recent moves indicate the steel mills are taking a close look at their prices; product by product. After four months of operations under the last wage increase, they are analyzing operating costs in relation to prices. The moves indicate that individual products are under study.

There is nothing in sight to indicate a major price change or a broad-based price move.

Atlantic Steel Co., Atlanta, cut prices of reinforcing bars $5 per ton. The change was made to bring the price in line with those of importers and small producers who were underselling the market.

District Steel Production Indexes 1957-59=100

	Last Week	Two Weeks Ago	Month Ago	Year Ago
North East Coast	92	89	87	128
Buffalo	77	66	71	143
Pittsburgh	80	79	79	129
Youngstown	65	71	62	137
Cleveland	89	70	70	165
Detroit	100	92	90	151
Chicago	92	94	93	142
Cincinnati	84	87	86	143
St. Louis	103	104	102	129
Southern	100	100	91	125
Western	106	108	103	116
U. S. Index	87.6	86.5	84.4	135.6

Source: American Iron & Steel Institute

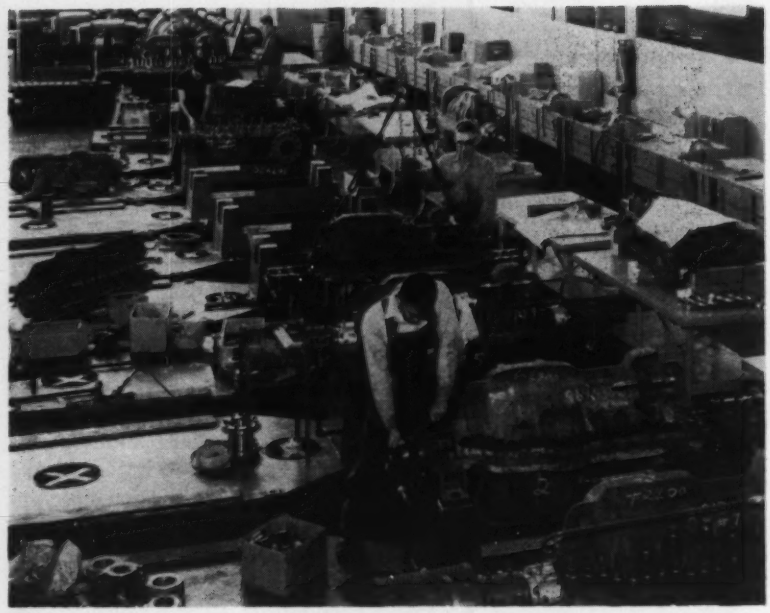
Steel Production, Composite Prices

Production	Last Week	Two Weeks Ago	To Date 1961	To Date 1960
(Net tons, 000 Omitted)	1,632	1,611	19,958	34,650
Ingot Index				
(1957-59=100)	87.6	86.5	82.4	143.1
Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel, base (Cents per lb)	6.196	6.196	6.196	6.196
Pig Iron (Gross ton)	$66.44	$66.44	$66.44	$66.41
Scrap No. 1 hvy (Gross ton)	$39.50	$39.17	$35.83	$33.17
No. 2 bundles	$27.50	$27.83	$26.17	$22.50

Pumps and Compressors Gain

After a slow start in the beginning of the year, producers of pumps and compressors say sales are gaining.

Though not quite as optimistic as in January, the industry still looks for a better year than 1960.



PUMPING AGAIN: After a sales dropoff in recent months, pump and compressor manufacturers now say business is increasing. March bookings were up; there are more current buyer inquiries.

■ The long-awaited pickup may be underway in the pumps and compressors industry.

Manufacturers surveyed by The IRON AGE in January predicted increased sales in 1961. These hopes were dampened when the sharp falloff in new orders during the last quarter of 1960 carried through January and February.

However, a recent check of pump and compressor makers indicates a pickup in March bookings and greatly increased buyer inquiries.

Quick Deliveries—All companies checked say deliveries are current. Backlogs are stable, or declining, and inventories, in most cases, are lower.

"The limiting factor in our backlog position is the manufacturing cycle, not backlog," says J. P. Adams, vice president and general manager, Byron Jackson Pumps, Inc. "Compared with a year ago, our backlog is at the same level. However, the product mix is off balance with much of the dollar volume in a few major contracts."

Stable Prices—Mr. Adams looks for some price improvement this year—perhaps 10 pct. Like others he says, "Prices can't go any lower."

Inventory control systems of some companies have prevented inventory buildups not justified by new order activity. The principal reduction of work in progress reflects a lower level of order input.

Better Shipments — Hale Fire Pump Co. reports current shipments better than a year ago. Shipments of most pumps are 10 days to two weeks for standard items; 30-45 days for specials, or about one to three weeks better than in 1960.

Johnston Pump Co. says delivery time for standard turbines, mixed flow and propeller pumps is one to three weeks. Specials are scheduled for one to three months.

Ship from Stock — Worthington Corp. reports it can ship from stock small standard centrifugal pumps, air compressors and air conditioning equipment. Delivery dates for large pumps, compressors, engines, condensers etc. range from six weeks to 18 months.

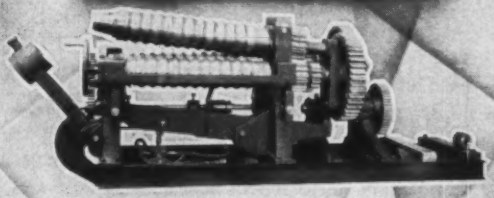
Stock units at Bell & Gossett Co. are shipped in three to four days. Built-to-order units vary from two to six weeks, depending on construction material and motor enclosures required.

Deliveries are current from stock at Gast Manufacturing Corp. This includes special pumps for air, vacuum to 28 in., and pressure below 25 psi.

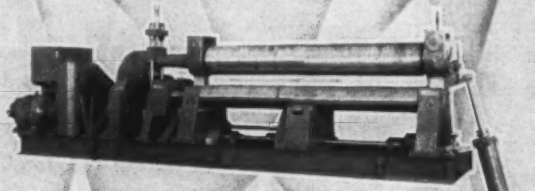
New Developments — The Oilgear Co. reports stepped-up development work on electrohydraulic servo-valve controlled two-way variable displacement pumps. They have a large potential in closed-loop machine control where stability, high system accuracy and controlled speed of response are essential.

SHEET METAL and PLATE-WORKING MACHINES

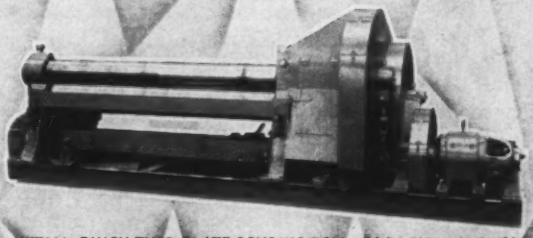
A complete line of heavy machinery for punching, shearing and bending sheet metal and heavy plates. . . .



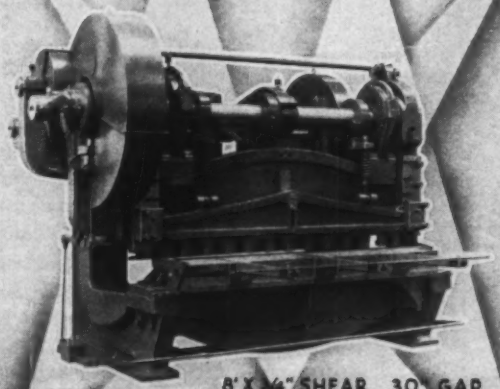
CORRUGATED CULVERT ROLL



PYRAMID TYPE PLATE BENDING ROLL, CAPACITY 1¼"X12'



INITIAL PINCH TYPE PLATE BENDING ROLL, CAPACITY ½"X8'



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BULLARD

INDUSTRIAL SAFETY EQUIPMENT

Write for Tip-Lock Safety Hoist Hook Data Sheet

E. D. BULLARD CO.

SAUSALITO, CALIFORNIA

"Dispatch 24" Speeds Wire

Wire and rod products have been hit hardest by competition from foreign mills.

But a U. S. producer is banking on 24-hour delivery to off-set any price disadvantage.

■ The nation's largest wire producer is offering guaranteed 24-hour shipments on standard products. It's an all-out effort to meet foreign and domestic competition.

American Steel and Wire Div. of U. S. Steel Corp. this week revealed a program designed to capitalize on fast shipment. The company believes this is its biggest competitive edge against imports which have cut into wire and rod sales more deeply than any other steel products.

Shortage Safeguard—"By establishing the wire industry's first official 24-hour shipping service for these products, we feel we are offering dealers a reliable safeguard against last minute shortages," says division president Van H. Leichliter in Cleveland.

"This will also relieve many of their costly warehousing and inventory problems, such as the risk of overstocking fast-moving seasonal products," he adds.

Priority Treatment — The program has been named "Dispatch 24." Within the mills, all shipments labeled as such will get priority treatment. Products covered include fence wire, nails, barbed wire, fence posts and bailing wire.

Mill inventories will be carried on 300 to 375 varieties of these products. Fast shipment will be available on truckload or carload orders of 10 tons or more. Mills participating are Worcester, Mass., Donora, Pa., Joliet, Ill., and Duluth, Minn. These mills ship to 27 states east of the Rocky Mountains.

Fast Order Entry—The program will get a strong assist from a new telegraphic sales order entry system and computer-regulated mill inventories. The new system has recently been installed at the division's 13 district sales offices and 11 plant locations.

Orders can be entered in three minutes after a tape has been punched. A new computer system at the Cleveland headquarters will also help determine availability and regulate inventory.

The program had its start last fall with the revamping of warehousing and shipping facilities at the four mills. Order entry, mill production, and inventory systems have also been thoroughly tested and streamlined to meet the requirements of the new priority shipping service.

Galvanized — U. S. Steel Corp. has moved to standardize extras of zinc coated products. In addition, the Corporation has introduced a new specialty product for painting; reduced the price of another specialty; and has taken the forming extra for culvert sheet out of the base price.

A new product, minimum-spangled sheet, has been introduced. It's designed especially for painting. It carries a price of 7.025¢ per lb. This is $3 a ton more than regular galvanized. The new sheet is specially coated, then rolled to eliminate the grains that would show through when painted.

Galvannealed sheet has been reduced $2 a ton. The new price is 7.175¢ per lb. The company says the reduction was made to put it in line with minimum-spangled and to reflect new cost experience. Galvannealed is specially treated to make the whole coating a zinc-iron alloy good for painting.

Width and gage extras for all zinc-coated products have been standardized. Regular galvanized is now available in widths down to 3 in.

On culvert sheet, the forming extra of 10¢ has been taken out of the base price. The reason given is that more customers are ordering culvert stock in flat form. However, this does not constitute a change in price.

Pipe and Tubing — Tubing specialties are still lagging, but most **Pittsburgh** mills report minor gains in oil country seamless. Inquiries for linepipe have also picked up. Mills say orders are due to move up seasonally. However, except for the **West Coast,** this hasn't happened yet.

Bars—Opinions differ on whether the market is any better. However, March was a little better than February. And mills expect some slight improvement to continue in April. **Pittsburgh** mills don't expect a sharp upturn. But they say it's difficult to forecast the market because there is so much late ordering. And an **East Coast** mill, which recently added a second shift, would like to drop it. But it doesn't want to take the chance of getting caught short. As the construction season continues to pickup demand for reinforcing bars are expected to keep pace and show more strength.

PURCHASING AGENT'S CHECKLIST

Don't overlook manufacturing when planning research. P. 68

Welding meets challenge of space age metals. P. 99

Welding Show features are detailed beginning on P. 138

COMPARISON OF PRICES

(Effective April 3, 1961)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Price changes from previous week are shown by an asterisk (*).

	Apr. 3 1961	Mar. 27 1961	Mar. 6 1961	Apr. 5 1960
Flat-Rolled Steel: (per pound)				
Hot-rolled sheets	5.10¢	5.10¢	5.10¢	5.10¢
Cold-rolled sheets	6.275	6.275	6.275	6.275
Galvanized sheets (10 ga.)	6.875	6.875	6.875	6.875
Hot-rolled strip	5.10	5.10	5.10	5.10
Cold-rolled strip	7.425	7.425	7.425	7.425
Plate	5.30	5.30	5.30	5.30
Plates, wrought iron	14.10	14.10	14.10	14.10
Stain'l's C-R strip (No. 302)	52.00	52.00	52.00	52.00
Tin and Terneplate: (per base box)				
Tin plates (1.50 lb.) cokes	$10.65	$10.65	$10.65	$10.65
Tin plates, electro (0.50 lb.)	9.35	9.35	9.35	9.35
Special coated mfg. ternes	9.90	9.90	9.90	9.90
Bars and Shapes: (per pound)				
Merchants bar	5.675¢	5.675¢	5.675¢	5.675¢
Cold finished bar	7.65	7.65	7.65	7.65
Alloy bar	6.725	6.725	6.725	6.725
Structural shapes	5.50	5.50	5.50	5.50
Stainless bars (No. 302)	46.75	46.75	46.75	46.75
Wrought iron bars	14.90	14.90	14.90	14.90
Wires: (per pound)				
Bright wire	8.00¢	8.00¢	8.00¢	8.00¢
Rails: (per 10 lb.)				
Heavy rails	$5.75	$5.75	$5.75	$5.75
Light rails	6.725	6.725	6.725	6.725
Semifinished Steel: (per net ton)				
Rerolling billets	$80.00	$80.00	$80.00	$80.00
Slabs, rerolling	80.00	80.00	80.00	80.00
Forging billets	99.50	99.50	99.50	99.50
Alloys, blooms, billets, slabs	119.00	119.00	119.00	119.00
Wire Rods and Skelp: (per pound)				
Wire rods	6.40¢	6.40¢	6.40¢	6.40¢
Skelp	5.05	5.05	5.05	5.05
Finished Steel Composite: (per pound)				
Base price	6.196¢	6.196¢	6.196¢	6.196¢

	Apr. 3 1961	Mar. 27 1961	Mar. 6 1961	Apr. 5 1960
Pig Iron: (per gross ton)				
Foundry, del'd Phila.	$70.68	$70.68	$70.68	$70.57
Foundry, South Cin'ti	71.92	71.92	71.92	73.87
Foundry, Birmingham	62.50	62.50	62.50	62.50
Foundry, Chicago	66.50	66.50	66.50	66.50
Basic, del'd Philadelphia	70.11	70.11	70.11	70.07
Basic, Valley furnace	66.00	66.00	66.00	66.00
Malleable, Chicago	66.50	66.50	66.50	66.50
Malleable, Valley	66.50	66.50	66.50	66.50
Ferromanganese, 74-76 pct Mn, cents per lb.‡	11.00	11.00	11.00	11.00
Pig Iron Composites: (per gross ton)				
Pig iron	$66.44	$66.44	$66.44	$66.41
Scrap: (per gross ton)				
No. 1 steel, Pittsburgh	$36.50*	$35.50	$34.50	$34.50
No. 1 steel, Phila. area	42.50	42.50	38.50	34.50
No. 1 steel, Chicago	39.50	39.50	34.50	30.50
No. 1 bundles, Detroit	34.50**	33.50	31.50	30.50
Low phos., Youngstown	40.50	40.50	39.50	38.50
No. 1 mach'y cast, Pittsburgh	45.50	45.50	45.50	52.50
No. 1 mach'y cast, Phila.	50.50	50.50	49.50	51.50
No. 1 mach'y cast, Chicago	51.50	51.50	49.50	52.50
Steel Scrap Composite: (per gross ton)				
No. 1 hvy. melting scrap	$39.50*	$39.17	$35.83	$33.17
No. 2 bundles	27.50*	27.83	26.17	22.50
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.75-15.50	14.75-15.50	14.75-15.50	14.75-15.50
Foundry coke, prompt	18.50	18.50	18.50	18.50
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electrolytic, Conn.	29.00	29.00	29.00	33.00
Copper, Lake, Conn.	29.00	29.00	29.00	33.00
Tin, Straits, N. Y.	100.50†	100.50	100.50	99.625
Zinc, East St. Louis	11.50	11.50	11.50	13.00
Lead, St. Louis	11.00	11.00	11.00	11.80
Aluminum, ingot	26.00	26.00	26.00	28.10
Nickel, electrolytic	74.00	74.00	74.00	74.00
Magnesium, ingot	36.00	36.00	36.00	36.00
Antimony, Laredo, Tex.	29.50	29.50	29.50	29.50

† Tentative. ‡ Average. ** Revised.

Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

Pig Iron Composite

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo and Birmingham.

Steel Scrap Composite

Average of No. 1 heavy melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

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*Appears in the March 30-April 13 issues.

New **ARMSTRONG Swivel Pad can't come off**

SEE US AT BOOTH #3906 ASTME SHOW, NEW YORK COLISEUM

Now ARMSTRONG deep throat "C" Clamps have the new (Pat. apd. for) ARMSTRONG Ball-joint Swivel Pad. This "C" Clamp pad, developed by ARMSTRONG Engineers, is tougher than any on the market. Rigorous testing in our own plant first proved this fact, and field tests in factories throughout the country have confirmed our own test results.

Here's Why it's STRONGER . . .

Your ARMSTRONG Distributor can deliver these new "400-Series" C-Clamps from stock. Catalog upon request.

The lip of the opening in the ARMSTRONG Ball-joint Swivel Pad is undercut so that when the ball of the screw is inserted, and the lip is permanently forced down, a solid steel wall is formed, inside the pad cavity, completely encircling the ball.

This wall of steel makes it impossible for the pad to come off the screw during normal use. In fact, our tests have proved that it is virtually impossible to intentionally knock the pad off with a hammer —yet the pad is free to swivel through an arc of approximately 40°.

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Market Begins To Level Off

Behind the current leveling of the market: Domestic buyers are still resisting prices.

Many scrapmen say export prices have reached their peak. Local support is needed for strength.

■ The scrap market appears to be leveling off—at least temporarily. Whether or not it will again gain the steam of recent weeks remains to be seen. The big reason for the leveling off is continued resistance from domestic buyers.

Scrapmen say export prices have reached the peak and domestic support is needed for additional strength.

However, the market is still strong. New York, for example, reports strong movement of steelmaking grades at current prices. The market climbed again this week in Pittsburgh.

But the market paused this week in Philadelphia, St. Louis, and Chicago. In the Midwest, confusion struck. Demand is faltering in Chicago because of early March's high level of scrap flow.

The IRON AGE composite price for No. 1 heavy melting rose to $39.50 this week on the basis of the Pittsburgh gain. However, the composite price for No. 2 bundles is down to $27.50 because of the Chicago drop.

Pittsburgh — The market moved up another notch this week as both dealer and industrial grades brought higher prices. A mill on the fringe of the district bought No. 1 heavy melting for $37 to the dealer. This was $2 more than the same mill paid last month. Local auto bundles sold for about $1.50 over last month's price. A mill in a nearby district is reportedly offering up to $40 for No. 1 heavy melting. There are also reports that scrap is being bought here for export. While most signs still point to price strength, some feel the market is ready to level off.

Chicago—In a confused market, factory bundle prices shot up and then backed off $1 in a period of two days. At the same time, mills purchased new lots of dealer steel at existing prices. Brokers cut back offering prices to dealers. And the market began to dry up from the high levels of scrap flow achieved in early March. Price spreads of as much as $4 between broker buyer and consumer delivered prices developed.

Philadelphia — The market appears to be pausing for a breather. Many scrapmen feel export prices have just about reached their limit. Therefore, sharp rises are unlikely without domestic demand. A large south Jersey foundry did come into the market for some cast scrap this week.

New York—Market shows some strength right down the line. Steelmaking grades are moving well at current prices. Turnings are still sluggish. But the movement, after long inactivity, has lifted prices $2 to $3. Cast grades are up $2 to $3 also on foundry orders.

Detroit — April's industrial list prices began strong but tapered off at the end. However, they wound up above March. Great Lakes Steel Corp. bought all of Chrysler's No. 1 bundles, about 7000 tons. Other mills were little or no factor. One reason the closing lists fell was because exporters dropped out of the market.

Cleveland—Local auto lists sold at quoted levels or about $2 ahead of one month ago. Most of the trade thought they would be higher. Export speculation has temporarily lost its steam. This may change when the Seaway opens and some shipments start going out.

Cincinnati—Market is up $1 on prime grades as area mills put out their monthly requirements. About half of local production bundles will stay in the area also. They went for $38.50 top on track. Market has temporarily cooled off, reflecting a slowdown in other areas.

St. Louis—A pause in the upward push of scrap prices is evident in the area. Mills are showing resistance to higher prices. Everyone seems a little on edge. For the present, the peak seems to have been reached.

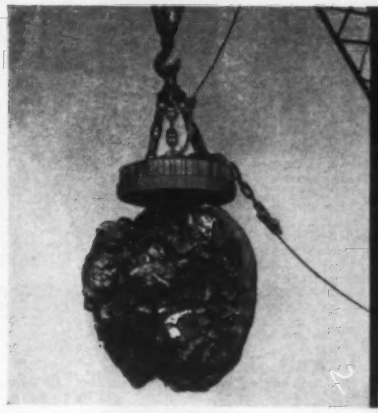
Birmingham — A large electric furnace increased its price $2 per ton when it returned to the market this week. Another mill indicates it will buy soon. The domestic market generally continues slow, however.

Buffalo—Export sales are keeping the market strong here. Prices are up again this week.

Boston — There are no price changes. Export is still the big market strength, but domestic demand is fair.

West Coast—No. 1 heavy melting and No. 2 bundles continue as the hottest export grades all along the coast. The trade says export business will remain brisk for the next three months.

Houston—The market retains its status quo. Export interest continues strong, but one major exporter reports that he has dropped out of the market.



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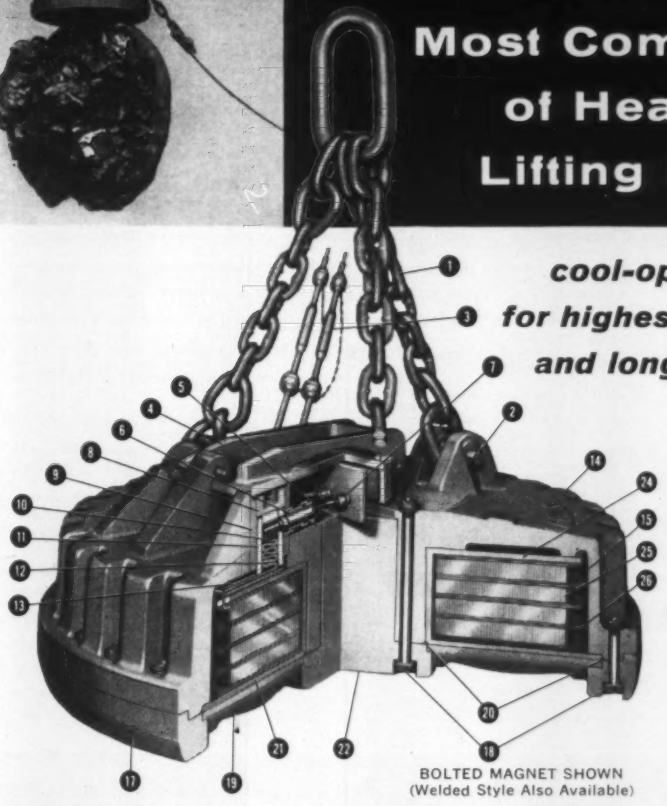

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SCRAP PRICES *(Effective April 3, 1961)*

Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Pittsburgh

No. 1 hvy. melting	$36.00 to $37.00
No. 2 hvy. melting	31.00 to 32.00
No. 1 dealer bundles	37.00 to 38.00
No. 1 factory bundles	45.00 to 46.00
No. 2 bundles	29.00 to 30.00
No. 1 busheling	36.00 to 37.00
Machine shop turn.	16.00 to 17.00
Shoveling turnings	21.00 to 22.00
Cast iron borings	20.00 to 21.00
Low phos. punch'gs plate	44.00 to 45.00
Heavy turnings	32.00 to 33.00
No. 1 RR hvy. melting	41.00 to 42.00
Scrap rails, random lgth	47.00 to 48.00
Rails, 2 ft and under	50.00 to 51.00
RR specialties	46.00 to 47.00
No. 1 machinery cast.	45.00 to 46.00
Cupola cast.	38.00 to 39.00
Heavy breakable cast.	35.00 to 36.00
Stainless	
18-8 bundles and solids	180.00 to 185.00
18-8 turnings	105.00 to 110.00
430 bundles and solids	80.00 to 85.00
410 turnings	60.00 to 65.00

Chicago

No. 1 hvy. melting	$39.00 to $40.00
No. 2 hvy. melting	31.00 to 32.00
No. 1 dealer bundles	39.00 to 40.00
No. 1 factory bundles	43.00 to 44.00
No. 2 bundles	25.00 to 26.00
No. 1 busheling	39.00 to 40.00
Machine shop turn.	17.00 to 18.00
Mixed bor. and turn.	18.00 to 19.00
Shoveling turnings	19.00 to 20.00
Cast iron borings	18.00 to 19.00
Low phos. forge crops	46.00 to 47.00
Low phos. punch'gs plate, ¼ in. and heavier	45.00 to 46.00
Low phos. 2 ft and under	42.00 to 43.00
No. 1 RR hvy. melting	41.00 to 42.00
Scrap rails, random lgth	49.00 to 50.00
Rerolling rails	60.00 to 61.00
Rails 2 ft and under	53.00 to 54.00
Angles and splice bars	47.00 to 48.00
RR steel car axles	61.00 to 63.00
RR couplers and knuckles	47.00 to 48.00
No. 1 machinery cast.	51.00 to 52.00
Cupola cast.	46.00 to 47.00
Cast iron wheels	37.00 to 38.00
Malleable	49.00 to 50.00
Stove plate	41.00 to 42.00
Steel car wheels	45.00 to 46.00
Stainless	
18-8 bundles and solids	180.00 to 185.00
18-8 turnings	105.00 to 110.00
430 bundles and solids	95.00 to 100.00
430 turnings	60.00 to 65.00

Philadelphia Area

No. 1 hvy. melting	$42.00 to $43.00
No. 2 hvy. melting	37.00 to 38.00
No. 1 dealer bundles	43.00 to 44.00
No. 2 bundles	27.00 to 28.00
No. 1 busheling	43.00 to 44.00
Machine shop turn.	15.00 to 16.00
Mixed bor. short turn.	16.00 to 17.00
Cast iron borings	14.00 to 15.00
Shoveling turnings	20.00 to 21.00
Clean cast. chem. borings	25.00 to 26.00
Low phos. 5 ft and under	45.00 to 46.00
Low phos. 2 ft punch'gs	46.00 to 48.00
Elec. furnace bundles	44.00 to 45.00
Heavy turnings	27.00 to 28.00
RR specialties	45.00 to 46.00
Rails, 18 in. and under	52.00 to 54.00
Cupola cast.	41.00 to 42.00
Heavy breakable cast.	40.00 to 41.00
Cast iron car wheels	43.00 to 44.00
Malleable	48.00 to 49.00
No. 1 machinery cast.	50.00 to 51.00

Cincinnati

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$32.00 to $33.00
No. 2 hvy. melting	29.50 to 30.50
No. 1 dealer bundles	32.00 to 33.00
No. 2 bundles	22.00 to 23.00
Machine shop turn.	11.00 to 12.00
Shoveling turnings	13.00 to 14.00
Cast iron borings	13.00 to 14.00
Low phos. 18 in. and under	38.00 to 39.00
Rails, random length	41.00 to 42.00
Rails, 18 in. and under	46.00 to 47.00
No. 1 cupola cast.	37.00 to 38.00
Heavy breakable cast.	31.00 to 32.00
Drop broken cast.	46.00 to 47.00

Youngstown

No. 1 hvy. melting	$38.00 to $39.00
No. 2 hvy. melting	25.00 to 26.00
No. 1 dealer bundles	39.00 to 40.00
No. 2 bundles	24.00 to 25.00
Machine shop turn.	15.00 to 16.00
Shoveling turnings	18.00 to 19.00
Low phos. plate	40.00 to 41.00

Cleveland

No. 1 hvy. melting	$34.50 to $35.50
No. 2 hvy. melting	24.00 to 25.00
No. 1 dealer bundles	35.50 to 36.50
No. 1 factory bundles	41.00 to 42.00
No. 2 bundles	22.50 to 23.50
No. 1 busheling	35.50 to 36.50
Machine shop turn.	13.00 to 14.00
Mixed bor. and turn.	16.00 to 17.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	16.00 to 17.00
Cut structural & plates, 2 ft & under	39.00 to 40.00
Low phos. punch'gs plate	36.50 to 37.50
Drop forge flashings	34.50 to 35.50
Foundry steel, 2 ft & under	33.00 to 34.00
No. 1 RR hvy. melting	38.50 to 39.50
Rails 2 ft and under	51.00 to 52.00
Rails 18 in. and under	53.00 to 54.00
Steel axle turnings	26.00 to 27.00
Railroad cast.	47.00 to 48.00
No. 1 machinery cast.	47.00 to 48.00
Stove plate	41.00 to 42.00
Malleable	46.00 to 47.00
Stainless	
18-8 bundles	175.00 to 180.00
18-8 turnings	95.00 to 100.00
430 bundles	85.00 to 90.00

Buffalo

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	25.00 to 26.00
No. 1 busheling	31.00 to 32.00
No. 1 dealer bundles	31.00 to 32.00
No. 2 bundles	22.00 to 23.00
Machine shop turn.	13.00 to 14.00
Mixed bor. and turn.	14.00 to 15.00
Shoveling turnings	17.00 to 18.00
Cast iron borings	15.00 to 16.00
Low phos. plate	37.00 to 38.00
Structurals and plate, 2 ft and under	39.00 to 40.00
Scrap rails, random lgth	38.00 to 39.00
Rails 2 ft and under	48.00 to 49.00
No. 1 machinery cast.	44.00 to 45.00
No. 1 cupola cast.	38.00 to 39.00

St. Louis

No. 1 hvy. melting	$35.00 to $36.00
No. 2 hvy. melting	29.00 to 30.00
Foundry steel, 2 ft	32.00 to 33.00
No. 1 dealer bundles	35.00 to 36.00
No. 2 bundles	25.00 to 26.00
Machine shop turn.	13.00 to 14.00
Shoveling turnings	15.00 to 16.00
Cast iron borings	21.00 to 22.00
No. 1 RR hvy. melting	38.00 to 39.00
Rails, random lengths	39.00 to 40.00
Rails, 18 in. and under	43.00 to 44.00
RR specialties	40.00 to 41.00
Cupola cast.	41.00 to 42.00
Heavy breakable cast.	33.00 to 34.00
Stove plate	34.00 to 35.00
Cast iron car wheels	35.00 to 36.00
Rerolling rails	54.00 to 55.00
Unstripped motor blocks	35.00 to 36.00

Birmingham

No. 1 hvy. melting	$34.00 to $35.00
No. 2 hvy. melting	29.00 to 30.00
No. 1 dealer bundles	34.00 to 35.00
No. 2 bundles	23.00 to 24.00
No. 1 busheling	37.00 to 38.00
Machine shop turn.	18.00 to 19.00
Shoveling turnings	20.00 to 21.00
Cast iron borings	10.00 to 11.00
Electric furnace bundles	37.00 to 38.00
Elec. furnace, 3 ft & under	36.00 to 37.00
Bar crops and plate	43.00 to 44.00
Structural and plate, 2 ft	42.00 to 43.00
No. 1 RR hvy. melting	36.00 to 37.00
Scrap rail, random lgth	41.00 to 42.00
Rails, 18 in. and under	46.00 to 47.00
Angles and splice bars	43.00 to 44.00
No. 1 cupola cast.	44.00 to 45.00
Stove plate	44.00 to 45.00
Cast iron car wheels	35.00 to 36.00
Unstripped motor blocks	33.00 to 34.00

New York

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$32.00 to $33.00
No. 2 hvy. melting	26.00 to 27.00
No. 2 dealer bundles	20.00 to 21.00
Machine shop turnings	5.00 to 6.00
Mixed bor. and turn.	5.00 to 6.00
Shoveling turnings	7.00 to 8.00
Clean cast. chem. borings	19.00 to 20.00
No. 1 machinery cast.	38.00 to 39.00
Mixed yard cast.	34.00 to 35.00
Heavy breakable cast.	32.00 to 33.00
Stainless	
18-8 prepared solids	160.00 to 165.00
18-8 turnings	80.00 to 85.00
430 prepared solids	70.00 to 75.00
430 turnings	20.00 to 25.00

Detroit

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	27.00 to 28.00
No. 1 dealer bundles	34.00 to 35.00
No. 2 bundles	21.00 to 22.00
No. 1 busheling	30.00 to 31.00
Drop forge flashings	29.00 to 30.00
Machine shop turn.	10.00 to 11.00
Mixed bor. and turn.	12.00 to 13.00
Shoveling turnings	13.00 to 14.00
Cast iron borings	13.00 to 14.00
Heavy breakable cast.	29.00 to 30.00
Mixed cupola cast.	36.00 to 37.00
Automotive cast.	40.00 to 41.00
Stainless	
18-8 bundles and solids	155.00 to 160.00
18-8 turnings	55.00 to 60.00
430 bundles and solids	60.00 to 65.00

Boston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$29.50 to $30.50
No. 2 hvy. melting	24.00 to 25.00
No. 1 dealer bundles	29.00 to 30.00
No. 2 bundles	16.00 to 17.00
No. 1 busheling	29.00 to 30.00
Machine shop turn.	4.00 to 4.50
Shoveling turnings	8.50 to 9.00
Clean cast. chem. borings	13.50 to 14.50
No. 1 machinery cast.	40.00 to 41.00
Mixed cupola cast.	32.00 to 32.50
Heavy breakable cast.	26.50 to 27.50

San Francisco

No. 1 hvy. melting	$40.00
No. 2 hvy. melting	37.00
No. 1 dealer bundles	32.00
No. 2 bundles	$23.00 to 25.00
Machine shop turn.	15.00
Cast iron borings	15.00
No. 1 cupola cast.	46.00 to 48.00

Los Angeles

No. 1 hvy. melting	$40.00
No. 2 hvy. melting	$37.00 to 38.00
No. 1 dealer bundles	30.00 to 31.00
No. 2 bundles	25.00
Machine shop turn.	15.00
Shoveling turnings	15.00
Cast iron borings	15.00
Elec. furnace 1 ft and under (foundry)	45.00
No. 1 cupola cast.	45.00

Seattle

No. 1 hvy. melting	$40.00
No. 2 hvy. melting	38.00
No. 2 bundles	25.00
No. 1 cupola cast.	36.00
Mixed yard cast.	31.00

Hamilton, Ont.

Brokers buying prices per net ton on cars:

No. 1 hvy. melting	$28.50
No. 2 hvy. melting cut 3 ft and under	25.00
No. 1 dealer bundles	28.50
No. 2 bundles	18.00
Mixed steel scrap	20.00
Bush., new fact., prep'd	28.50
Bush., new fact., unprep'd	22.00
Machine shop turn.	8.00
Short steel turn.	12.00
Mixed bor. and turn.	12.00
Cast scrap	32.00

Houston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$39.00
No. 2 hvy. melting	36.00
No. 2 bundles	28.00
Machine shop turn.	8.00
Shoveling turnings	11.00
Cut structural plate 2 ft & under	$50.00 to 51.00
Unstripped motor blocks	32.00 to 33.00
Cupola cast.	37.00 to 38.00
Heavy breakable cast.	30.00 to 31.00

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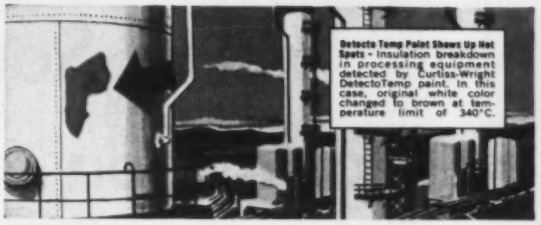
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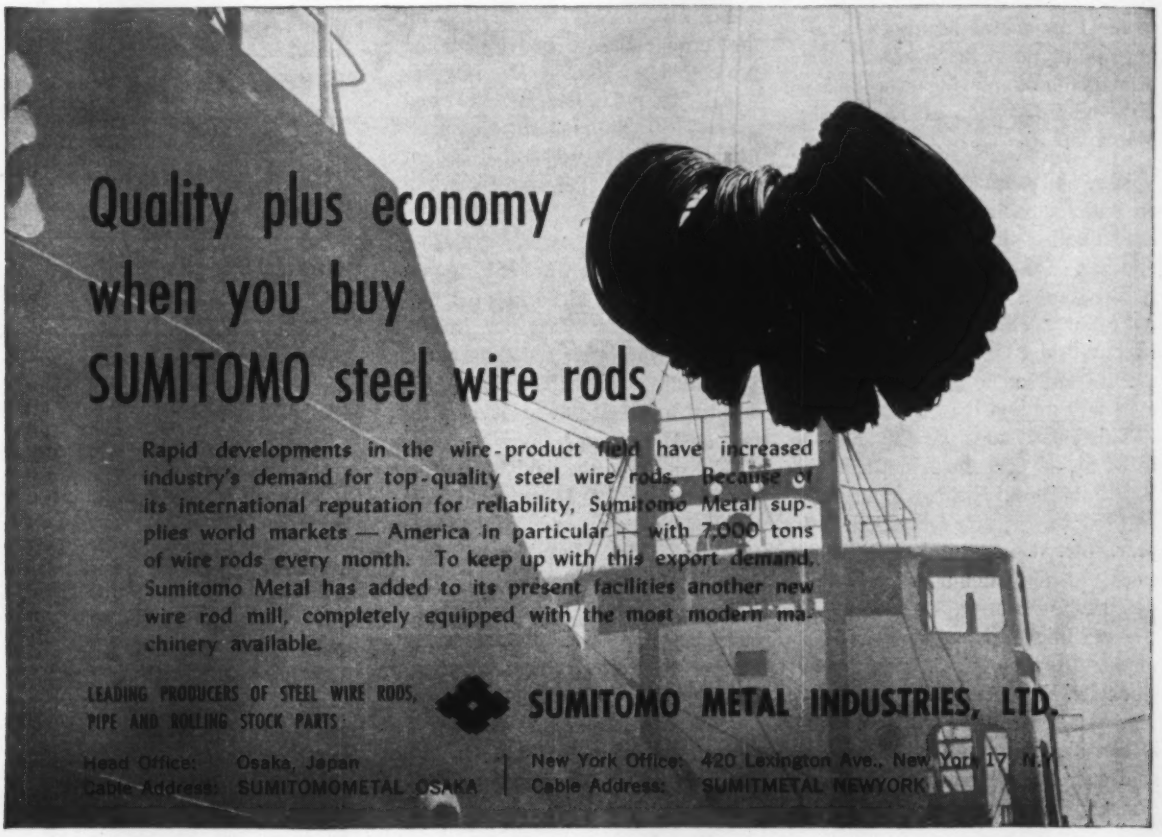
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New Nickel Source In Production

Nickel, which has been through varying degrees of scarcity, should be in ample supply for some years.

Inco's Thompson plant will add 75 million lb of annual nickel capacity.

■ International Nickel Co. has virtually assured the Free World's supply of nickel for the immediate future—perhaps for the next decade. Barring, of course, something unforeseen.

Company chairman Henry S. Wingate, and Duff Roblin, Premier of the Province of Manitoba, Canada, jointly threw the switch to start primary nickel moving from Inco's giant new operation at Thompson, Manitoba.

Here and Abroad—The plant has an initial capacity of 75 million lb. About half of this will go to Europe and half to the U. S.

This boosts Inco's nickel capacity to over 385 million lb yearly. Free World capacity, not counting the 100 million lb in Cuba, is now over 600 million lb.

This clearly tops the 515 million lb of nickel consumed in the Free World in 1960. Estimates put likely 1961 buying about equal to last year. Mr. Wingate said Inco nickel sales are now running slightly under the last quarter, 1960 rate.

Also, nickel is coming on the market from the U. S. government stockpile. How much is in the stockpile, and how much it will part with, is classified information. But Inco sold over 50 million lb to the government last year, and will move 40 million lb more in 1961.

Plant Tour — At Thompson, a tour through the Inco operation reveals numerous strategically-placed, but unused, foundations and vacancies for machinery and equipment. As big as it is now, the Thompson operation can quickly and cheaply expand. One source guesses by about double.

The Thompson project is unique in several ways. It is the world's second largest nickel operation. And the company says it is the only one completely integrated — mine to metal—on the same site.

Big Investment—By the time all the loose ends are tied up on the project, later this year, International Nickel Co. will have invested over $130 million, all company funds. This is a substantial bet on the growth of nickel markets in the foreseeable future.

The company started exploring the area in 1946. In 1951, use of newly developed airborne prospecting devices sped things up. In December, 1956, after spending about $10 million for exploration, Inco decided to go all out to develop its find at Thompson.

The site is in the wilds of Northern Manitoba. A 30-mile rail spur to the property was completed in October, 1957. Inco loaned $20 million to the Manitoba Hydro-Electric Board, at 2 pct interest, to construct the Kelsey Generating Station to supply power. Kelsey, over 50 miles from Thompson, cost a total of $48 million, and has a current capacity of 168,750 kw. This can be developed to an ultimate of 337,500 kw.

The location itself is favorable from several viewpoints. It is a matter of hours by rail to the northern port of Churchill. This will facilitate shipping to the currently booming European market.

Copper

The Copper Products Development Assn. has appropriated $192,000 to continue its program to develop new and improved uses for copper.

Battelle Memorial Institute, Columbus, O., will continue to probe for a tarnish resistant copper by metallurgical surface treatment. It will also investigate use of copper as an alloy in cast iron.

Quantum, Inc., Wallingford, Conn., will study potential use of copper compounds as an additive for gasoline.

Dynatech Corp., Cambridge, Mass., will seek a new form of copper that is thermally conductive but electrically insulating.

And Chase Brass & Copper Co., Waterbury, Conn., will continue its evaluation of clear plastics for protection of copper alloys.

Tin Prices For the Week

March 28—103.875; March 29—104.375; March 30—104.625; March 31—Holiday; April 3—Holiday.

Primary Prices

(cents per lb.)	current price	last price	date of change
Aluminum Ingot	26.00	24.70	12/17/59
Copper (E)	29.00	30.00	1/16/61
Copper (CS)	29.00	30.00	1/11/61
Copper (L)	29.00	30.00	1/16/61
Lead, St. L.	10.80	11.80	12/13/60
Lead, N. Y.	11.00	12.00	12/13/60
Magnesium Ingot	36.00	34.50	8/13/56
Magnesium pig	35.25	33.75	8/13/56
Nickel	74.00	64.50	12/6/56
Titanium sponge	150-160	182-182	8/1/59
Zinc, E. St. L.	11.50	12.50	1/12/61
Zinc, N. Y.	12.00	13.00	1/12/61

ALUMINUM: 99% Ingot. COPPER: (E) = electrolytic, (CS) = custom smelters, electrolytic. (L) = lake. LEAD: common grade. MAGNESIUM: 99.8% pig Velasco, Tex. NICKEL: Port Colborne, Canada. ZINC: prime western. Other primary prices, pg. 153.

NONFERROUS PRICES

MILL PRODUCTS

(Cents per lb unless otherwise noted)

ALUMINUM

(Base 30,000 lb, f.o.b. customer's plant)

Flat Sheet (Mill Finish and Plate)

("F" temper except 6061-0)

Alloy	.030-.038	.048-.061	.077-.096	.136-.250
1100, 3003	48.4	47.4	46.4	45.4
5052	55.8	53.0	50.8	49.2
6061-0	53.0	50.3	48.4	47.0

Extruded Solid Shapes

Factor	6063 T-5	6062 T-6
1-17	45.3-46.8	54.0-61.8
18-32	45.8-47.5	58.6-81.5
33-38	49.5-52.2	85.1-96.6
39-44	59.8-63.6	102.0-124.0

Screw Machine Stock—2011-T-3

Size"	7/32-5/16	11/32-23/32	3/4-1 1/16	1 3/32-1 1/2
Price	60.0	59.2	57.7	55.3

Roofing Sheet, Corrugated

(Per sheet, 26" wide base, 16,000 lb)

Length"→	72	96	120	144
.019 gage	$1.506	$2.013	$2.515	$3.017

MAGNESIUM

(F.o.b. shipping pt., carload frt. allowed)

Sheet and Plate

Type↓ Gage→	.250 3.00	.250-2.00	.188	.081	.032
AZ31B Stand. Grade	.....	67.9	69.0	77.9	103.1
AZ31B Spec.	.....	93.3	96.9	108.7	171.3
Tread Plate	.....	70.6	71.7	.....	.....
Tooling Plate	73.0	.....	.....	.....	.....

Extruded Shapes

factor→	6-8	12-14	24-26	36-38
Comm. Grade (AZ31C)	65.3	65.3	66.1	71.5
Spec. Grade (AZ31B)	84.6	85.7	90.6	104.2

Alloy Ingot

AZ91B (Die Casting) ..... 37.25 (delivered)
AZ63A, AZ92A, AZ91C (Sand Casting) 40.75 (Velasco, Tex.)

NICKEL, MONEL, INCONEL

(Base prices f.o.b. mill)

	"A" Nickel	Monel	Inconel
Sheet, CR	138	120	138
Strip, CR	124	108	138
Rod, bar, HR	107	89	109
Angles, HR	107	89	109
Plates, HR	130	110	126
Seamless tube	157	129	200
Shot, blocks	...	87	...

COPPER, BRASS, BRONZE

(Freight included in 5000 lbs)

	Sheet	Wire	Rod	Tube
Copper	54.13	.....	51.36	55.32
Brass, Yellow	48.10	48.39	48.04	52.26
Brass, Low	50.65	50.94	50.59	54.71
Brass, Red	51.54	51.83	51.48	55.60
Brass, Naval	52.86	59.17	46.67	57.02
Munts Metal	50.94	.....	46.25	.....
Comm. Bz.	52.98	53.27	52.92	56.79
Mang. Bz.	56.80	.....	50.20	.....
Phos. Bz. 5%	74.59	74.34	75.09	76.52

Free Cutting Brass Rod 33.71

TITANIUM

(Base Prices f.o.b. mill)

Sheet and strip, commercially pure, $6.75-$13.00; alloy, $13.40-$17.00. Plate, HR, commercially pure, $5.25-$9.00; alloy, $8.00-$10.00. Wire, rolled and/or drawn, commercially pure, $5.55-$6.05; alloy, $5.55-$9.00; bar, HR or forged, commercially pure, $4.00-$4.50; alloy, $4.00-$6.25; billets, HR, commercially pure, $3.20-$3.70; alloy, $3.20-$4.75.

PRIMARY METAL

(Cents per lb otherwise noted)

Antimony, American, Laredo, Tex.. 29.50
Beryllium Aluminum 5% Be, Dollars per lb contained Be $65.00
Beryllium copper, per lb cont'd Be. $43.00
Beryllium 97% lump or beads, f.o.b. Cleveland, Reading $70.00
Bismuth, ton lots ..... $ 2.25
Cadmium, del'd ..... $ 1.50
Calcium, 99.9% small lots ..... $ 4.55
Chromium, 99.8% metallic base.... $ 1.31
Cobalt, 97-99% (per lb) ...$1.50 to $ 1.57
Germanium, per gm, f.o.b. Miami, Okla., refined ..... $29.95 to $36.95
Gold, U. S. Treas., per troy oz..... $35.00
Indium, 99.9% dollars per troy oz..$ 2.25
Iridium, dollars per troy oz.....$75 to $85
Lithium, 98% ..... $9.00 to $12.00
Magnesium sticks, 10,000 lb..... 57.00
Mercury, dollars per 76-lb flask f.o.b. New York ..... $206 to $208
Nickel oxide sinter at Buffalo, N. Y., or other U. S. points of entry, contained nickel 69.60
Palladium, dollars per troy oz...$24 to $26
Platinum, dollars per troy oz...$82 to $85
Rhodium ..... $137 to $140
Silver ingots (¢ per troy oz.) 91.375
Thorium, per kg $43.00
Vanadium ..... $ 3.65
Zirconium sponge ..... $ 5.00

REMELTED METALS

Brass Ingot

(Cents per lb delivered, carloads)

85-5-5 ingot
- No. 115 ..... 29.25
- No. 120 ..... 28.50
- No. 123 ..... 27.75

80-10-10 ingot
- No. 305 ..... 33.50
- No. 315 ..... 31.25

88-10-2 ingot
- No. 210 ..... 41.25
- No. 215 ..... 38.00
- No. 245 ..... 33.25

Yellow ingot
- No. 405 ..... 25.00

Manganese bronze
- No. 421 ..... 28.75

Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys
- 0.30 copper max. 24.25-24.50
- 0.60 copper max. 24.00-24.25

Piston alloys (No. 132 type)..26.00-27.00
No. 12 alum. (No. 2 grade)...22.75-23.25
108 alloy 23.25-23.75
195 alloy 25.75-26.75
13 alloy (0.60 copper max.)...24.00-24.25
AXS-679 (1 pct zinc) 23.00-24.00

Steel deoxidizing aluminum notch bar granulated or shot
- Grade 1—95-97½% 23.75-24.75
- Grade 2—92-95% 22.50-23.50
- Grade 3—90-92% 21.50-22.50
- Grade 4—85-90% 21.00-22.00

SCRAP METAL

Brass Mill Scrap

(Cents per pound, add 1¢ per lb for shipments of 20,000 lb and over)

	Heavy	Turnings
Copper	25	24¼
Yellow brass	19¼	17⅝
Red brass	22¼	21½
Comm. bronze	23	22¼
Mang. bronze	18½	17⅝
Free cutting rod ends.	18⅝	

Customs Smelters Scrap

(Cents per pound carload lots, delivered to refinery)

- No. 1 copper wire 25½
- No. 2 copper wire 23¾
- Light copper 21½
- *Refining brass 22¼
- Copper bearing material 21¼

*Dry copper content.

Ingot Makers Scrap

(Cents per pound carload lots, delivered to refinery)

- No. 1 copper wire 25½
- No. 2 copper wire 23¾
- Light copper 21½
- No. 1 composition 22
- No. 1 comp. turnings 21½
- Hvy yellow brass solids 16½
- Brass pipe 14½
- Radiators 17½

Aluminum

- Mixed old cast. ..... 12½—13
- Mixed new clips ..... 14½—15
- Mixed turnings, dry ..... 13½—14

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Copper and Brass

No. 1 copper wire	23 —23
No. 2 copper wire	20½—21½
Light copper	18½—19
Auto radiators (unsweated)	13½—13¾
No. 1 composition	17¾—18¼
No. 1 composition turnings	16¾—17¼
Cocks and faucets	13¾—14¼
Clean heavy yellow brass	10¾—11¼
Brass pipe	14¼—14¾
New soft brass clippings	13¾—14¼
No. 1 brass rod turnings	13¾—14¼

Aluminum

Alum. pistons and struts	6½— 7
Aluminum crankcase	8½— 9
1100 (2s) aluminum clippings	11¼—11¾
Old sheet and utensils	8½— 9
Borings and turnings	4½— 5
Industrial castings	9 — 9½
2020 (24s) clippings	10 —10½

Zinc

New zinc clippings	5½— 5¾
Old zinc	2¾— 3
Zinc routings	1¾— 2
Old die cast scrap	1 — 1¼

Nickel and Monel

Pure nickel clippings	52-54
Clean nickel turnings	40
Nickel anodes	52-54
Nickel rod ends	52-54
New Monel clippings	23-23.50
Clean Monel turnings	16.50-17
Old sheet Monel	22-23
Nickel silver clippings, mixed.	18
Nickel silver turnings, mixed.	15

Lead

Soft scrap lead	7 — 7½
Battery plates (dry)	2¾
Batteries, acid free	2 — 2¼

Miscellaneous

Block tin	75 —77
No. 1 pewter	57 —58
Auto babbitt	43 —44
Mixed common babbitt	9½—10
Solder joints	13½—14
Small foundry type	8½— 9
Monotype	8¾— 9¼
Lino. and stereotype	8 — 8¼
Electrotype	7½— 7¾
Hand picked type shells	5¼— 5¾
Lino. and stereo. dross	1¾— 2¼
Electro dross	2 — 2½

(Effective Apr. 3, 1961)

STEEL PRICES

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BILLETS, BLOOMS, SLABS			PILING	SHAPES, STRUCTURALS			STRIP					
		Carbon Rerolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton	Sheet Steel	Carbon	Hi Str. Low Alloy	Carbon Wide-Flange	Hot-rolled	Cold-rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot-rolled	Alloy Cold-rolled
EAST	Bethlehem, Pa.			$119.00 *B3*		5.55 *B3*	8.10 *B3*	5.55 *B5*						
	Buffalo, N. Y.	$80.00 *R3, B3*	$99.50 *R3, B3*	$119.00 *R3, B3*	6.50 *B3*	5.55 *B3*	8.10 *B3*	5.55 *B3*	5.10 *B3,*	7.425 *S10, R7*	7.575 *B3*			
	Phila., Pa.									7.875 *P15*				
	Harrison, N. J.													15.55 *C11*
	Conshohocken, Pa.		$104.50 *A2*	$126.00 *A2*					5.15 *A2*		7.575 *A2*			
	New Bedford, Mass.									7.875 *R6*				
	Johnstown, Pa.	$80.00 *B3*	$99.50 *B3*	$119.00 *B3*		5.55 *B3*	8.10 *B3*							
	Boston, Mass.									7.975 *T8*				15.90 *T8*
	New Haven, Conn.									7.875 *D1*				
	Baltimore, Md.									7.425 *T8*				15.90 *T8*
	Phoenixville, Pa.					5.55 *P2*	8.10 *P2*	5.55 *P2*						
	Sparrows Pt., Md.								5.10 *B3*		7.575 *B3*			
	New Britain, Wallingford, Conn.			$119.00 *N8*						7.875 *W1,S7*				
	Pawtucket, R. I. Worcester, Mass.									7.975 *N7, A5*				15.90 *N7* 15.70 *T8*
MIDDLE WEST	Alton, Ill.								5.30 *L1*					
	Ashland, Ky.								5.10 *A7*		7.575 *A7*			
	Canton-Massillon, Dover, Ohio		$102.00 *R3*	$119.00 *R3, T5*						7.425 *G4*		10.80 *G4*		
	Chicago, Franklin Park, Evanston, Ill.	$80.00 *U1, R3*	$99.50 *U1, R3,W8*	$119.00 *U1, R3,W8*	6.50 *U1*	5.50 *U1, W8,P13*	8.05 *U1, Y1,W8*	5.50 *U1*	5.10 *W8, N4,A1*	7.525 *A1,T8, M8* 7.525* *M8*	7.575 *W8*		8.40 *W8, S9,13*	15.55 *A1, S9,G4,T8*
	Cleveland, Ohio									7.425 *A5,J3*		10.75 *A5*	8.40 *J3*	15.60 *N7*
	Detroit, Mich.			$119.00 *R5*					5.10 *G3, M2*	7.425 *M2, S1, D1, P11, B9*	7.575 *G3*	10.80 *S1*		
	Anderson, Ind.									7.425 *G4*				
	Gary, Ind. Harbor, Indiana	$80.00 *U1*	$99.50 *U1*	$119.00 *U1, Y1*		5.50 *U1, I3, Y1*	8.05 *U1, J3*	5.50 *I3*	5.10 *U1, I3,Y1*	7.425 *Y1*	7.575 *U1, I3,Y1*	10.90 *Y1*	8.40 *U1, Y1*	
	Sterling, Ill.	$80.00 *N4*				5.50 *N4*	7.75 *N4*	5.50 *N4*	5.20 *N4*					
	Indianapolis, Ind.									7.575 *R5*				15.70 *R5*
	Newport, Ky.								5.10 *A9*				8.40 *A9*	
	Niles, Warren, Struthers, Ohio Sharon, Pa.		$99.50 *S1, C10*	$119.00 *C10,S1*		5.50 *Y1*			5.10 *R3, S1*	7.425 *R3, T4,S1*	7.575 *R3, S1*	10.80 *R3, S1*	8.40 *S1*	15.55 *S1*
	Owensboro, Ky.	$80.00 *G5*	$99.50 *G5*	$119.00 *G5*										
	Pittsburgh, Midland, Butler, Aliquippa, N. Castle, McKeesport, Pa.	$80.00 *U1, P6*	$99.50 *U1, C11,P6*	$119.00 *U1, C11,B7*	6.50 *U1*	5.50 *U1, J3*	8.05 *U1, J3*	5.50 *U1*	5.10 *P6*	7.425 *J3, B4, M10* 7.525 *E3*			8.40 *S9*	15.55 *S9* 15.60 *N7*
	Weirton, Wheeling, Follansbee, W. Va.				6.50 *U1, W3*	5.50 *W3*		5.50 *W3*	5.10 *W3*	7.425 *W5*	7.575 *W3*	10.80 *W3*		
	Youngstown, Ohio	$80.00 *R3*	$99.50 *Y1, C10*	$119.00 *Y1*			8.05 *Y1*		5.10 *U*	7.425 *Y1,R5*	7.575 *U1, Y1*	10.95 *Y1*	8.40 *U1, Y1*	15.55 *R5, Y1*
WEST	Fontana, Cal.	$90.50 *K1*	$109.00 *K1*	$140.00 *K1*		6.30 *K1*	8.85 *K1*	6.45 *K1*	5.825 *K1*	9.20 *K1*				
	Geneva, Utah		$99.50 *C7*			5.50 *C7*	8.05 *C7*							
	Kansas City, Mo.					5.60 *S2*	8.15 *S2*						8.65 *S2*	
	Los Angeles, Torrance, Cal.		$109.00 *B2*	$139.00 *B2*		6.20 *C7, B2*	8.75 *B2*		5.85 *C7, B2*	9.30 *C1,R5*			9.60 *B2*	17.75 *J3*
	Minnequa, Colo.					5.80 *C6*			6.20 *C6*	9.375 *C6*				
	Portland, Ore.					6.25 *O2*								
	San Francisco, Niles, Pittsburg, Cal.		$109.00 *B2*			6.15 *B2*	8.70 *B2*		5.85 *C7, B2*					
	Seattle, Wash.		$109.00 *B2*	$140.00 *B2*		6.25 *B2*	8.80 *B2*		6.10 *B2*					
SOUTH	Atlanta, Ga.					5.70 *A8*			5.10 *A8*					
	Fairfield, City, Ala. Birmingham, Ala.	$80.00 *T2*	$99.50 *T2*			5.50 *T2 R3,C16*	8.05 *T2*		5.10 *T2, R3,C16*		7.575 *T2*			
	Houston, Lone Star, Texas		$104.50 *S2*	$124.00 *S2*		5.60 *S2*	8.15 *S2*						8.65 *S2*	

* Electro-galvanized-plus galvanizing extras.

(Effective Apr. 3, 1961)

IRON AGE

STEEL PRICES

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		SHEETS								WIRE ROD	TINPLATE†		
		Hot-rolled *18* ga. & hvyr.	Cold-rolled	Galvanized (Hot-dipped)	Enameling	Long Terne	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.		Cokes* *1.25*-lb. base box	Electro** *0.25*-lb. base box	Thin *0.25* lb. coating in coils
EAST	Buffalo, N. Y.	5.10 *B3*	6.275 *B3*				7.525 *B3*	9.275 *B3*		6.40 *W6*	† Special coated mfg. terne deduct 35¢ from 1.25-lb. coke base box price 0.75 lb. 0.25 lb. add 55¢. Can-making quality BLACKPLATE 55 to 128 lb. deduct $2.20 from 1.25 lb. coke base box. * COKES: 1.50-lb. add 25¢. **ELECTRO: 0.50-lb. add 25¢; 0.75-lb. add 65¢; 1.00-lb. add $1.00. Differential 1.00 lb., 0.25 lb. add 65¢.		Prices are for 50 lb. base box; for 45 lb. deduct 15¢; for 55 lb. add 15¢; for 60 lb. add 30¢.
	Claymont, Del.												
	Coatesville, Pa.												
	Conshohocken, Pa.	5.15 *A2*	6.325 *A2*				7.575 *A2*						
	Harrisburg, Pa.												
	Hartford, Conn.												
	Johnstown, Pa.									6.40 *B3*			
	Fairless, Pa.	5.15 *U1*	6.325 *U1*				7.575 *U1*	9.325 *U1*				$9.10 *U1*	$6.25 *U1*
	New Haven, Conn.												
	Phoenixville, Pa.												
	Sparrows Pt., Md.	5.10 *B3*	6.275 *B3*	6.875 *B3*	6.775 *B3*		7.525 *B3*	9.275 *B3*	10.025 *B3*	6.50 *B3*	$10.40 *B3*	$9.10 *B3*	$6.25 *B3*
	Worcester, Mass.									6.70 *A5*			
MIDDLE WEST	Alton, Ill.									6.60 *L1*	Holloware Enameling 29 ga.—7.85 *U1* at Gary; Pittsburgh; *J3* at Aliquippa; *W5* at Yorkville; *Y1* at Indiana Harbor; *W5* at Wheeling; 7.95 *G2* at Granite City.		
	Ashland, Ky.	5.10 *A7*		6.875 *A7*	6.775 *A7*		7.525 *A7*						
	Canton-Massillon, Dover, Ohio			6.875 *R1, R3*									
	Chicago, Joliet, Ill.	5.10 *W8, A1*					7.525 *U1, W8*			6.40 *A5, R3, W8*			
	Sterling, Ill.									6.50 *N4, K2*			
	Cleveland, Ohio	5.10 *R3, J3*	6.275 *R3, J3*	7.65 *R3**	6.775 *R3*		7.525 *R3, J3*	9.275 *R3, J3*		6.40 *A5*			
	Detroit, Mich.	5.10 *G3, M2*	6.275 *G3, M2*				7.525 *G3*	9.275 *G3*					
	Newport, Ky.	5.10 *A9*	6.275 *A9*										
	Gary, Ind. Harbor, Indiana	5.10 *U1, I3, Y1*	6.275 *U1, I3, Y1*	6.875 *U1, I3*	6.775 *U1, I3, Y1*	7.225 *U1*	7.525 *U1, Y1, I3*	9.275 *U1, Y1*		6.40 *Y1*	$10.40 *U1, Y1*	$9.10 *I3, U1, Y1*	$6.25 *U1, I3*
	Granite City, Ill.	5.20 *G2*	6.375 *G2*	6.975 *G2*								$9.20 *G2*	
	Kokomo, Ind.			6.975 *C9*						6.50 *C9*			
	Mansfield, Ohio	5.10 *E2*	6.275 *E2*			7.225 *E2*							
	Middletown, Ohio		6.275 *A7*	6.875 *A7*	6.775 *A7*	7.225 *A7*							
	Niles, Warren, Ohio Sharon, Pa.	5.10 *R3, S1*	6.275 *R3*	6.875 *R3* 7.65 *R3**	6.775 *S1*	7.225 *S1*†† *R3*	7.525 *R3, S1*	9.275 *R3*				$9.10 *R3*	
	Pittsburgh, Midland, Butler, Aliquippa, McKeesport, Pa.	5.10 *U1, J3, P6*	6.275 *U1, J3, P6*	6.875 *U1, J3* 7.50 *E3**	6.775 *U1*		7.525 *U1, J3*	9.275 *U1, J3*	10.025 *U1, J3*	6.40 *A5, J3, P6*	$10.40 *U1, J3*	$9.10 *U1, J3*	$6.25 *U1*
	Portsmouth, Ohio	5.10 *P7*	6.275 *P7*							6.40 *P7*			
	Weirton, Wheeling, Follansbee, W. Va.	5.10 *W3, W5*	6.275 *W3, F3, W5*	6.875 *W3, W5* 7.50 *W3**		7.225 *W3, W5*	7.525 *W3*	9.275 *W3*			$10.40 *W5, W3*	$9.10 *W5, W3*	$6.40 *W5*** $6.25 *W3*
	Youngstown, Ohio	5.10 *U1, Y1*	6.275 *Y1*		6.775 *Y1*		7.525 *Y1*	9.275 *Y1*		6.40 *Y1*			
WEST	Fontana, Cal.	5.825 *K1*	7.40 *K1*				8.25 *K1*	10.40 *K1*			$11.05 *K1*	$9.75 *K1*	
	Geneva, Utah	5.20 *C7*											
	Kansas City, Mo.									6.65 *S2*			
	Los Angeles, Torrance, Cal.									7.20 *B2*			
	Minnequa, Colo.									6.65 *C6*			
	San Francisco, Niles, Pittsburg, Cal.	5.80 *C7*	7.225 *C7*	7.625 *C7*						7.20 *C7*	$11.05 *C7*	$9.75 *C7*	
SOUTH	Atlanta, Ga.												
	Fairfield, Ala. Alabama City, Ala.	5.10 *T2, R3*	6.275 *T2, R3*	6.875 *T2, R3*	6.775 *T2*					6.40 *T2, R3*	$10.40 *T2*	$9.10 *T2*	$6.25 *T2*
	Houston, Texas									6.65 *S2*			

* Electrogalvanized sheets. ** For 55 lb.; for 60 lb. add 15¢.

†† 7.425 at Sharon; Niles is 7.225.

(Effective Apr. 3, 1961)

STEEL PRICES

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BARS						PLATES				WIRE
		Carbon† Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Floor Plate	Alloy	Hi Str. Low Alloy	Mfr's. Bright
EAST	Bethlehem, Pa.				6.725 *B3*	9.025 *B3*	8.30 *B3*					
	Buffalo, N. Y.	5.675 *R3,B3*	5.675 *R3,B3*	7.70 *B5*	6.725 *B3,R3*	9.025 *B3,B5*	8.30 *B3*	5.30 *B3*				8.00 *W6*
	Claymont, Del.							5.30 *P2*	6.375 *P2*	7.50 *P2*	7.95 *P2*	
	Coatesville, Pa.							5.30 *L4*		7.50 *L4*	7.95 *L4*	
	Conshohocken, Pa.							5.30 *A2*	6.375 *A2*	7.50 *A2*	7.95 *A2*	
	Milton, Pa.	5.825 *M7*	5.825 *M7*									
	Hartford, Conn.			8.15 *R3*		9.325 *R3*						
	Johnstown, Pa.	5.675 *B3*	5.675 *B3*		6.725 *B3*		8.30 *B3*	5.30 *B3*		7.50 *B3*	7.95 *B3*	8.00 *B3*
	Steelton, Pa.		5.675 *B3*									
	Fairless, Pa.	5.825 *U1*	5.825 *U1*									
	Newark, Camden, N. J.			8.10 *W10, P10*		9.20 *W10, P10*						
	Bridgeport, Putnam, Willimantic, Conn.			8.20 *W10* 8.15 *J3*	6.80 *N8*	9.175 *N8*						
	Sparrows Pt., Md.		5.675 *B3*					5.30 *B3*		7.50 *B3*	7.95 *B3*	8.10 *B3*
	Palmer, Worcester, Readville, Mansfield, Mass.			8.20 *B5, C14*		9.325 *A5,B5*						8.30 *A5, W6*
	Spring City, Pa.			8.10 *K4*		9.20 *K4*						
MIDDLE WEST	Alton, Ill.	5.875 *L1*										8.20 *L1*
	Ashland, Newport, Ky.							5.30 *A7,A9*		7.50 *A9*	7.95 *A7*	
	Canton, Massillon, Mansfield, Ohio	6.15* *R3*		7.65 *R3,R2*	6.725 *R3, T5*	9.025 *R3,R2, T5*		5.30 *E2*				
	Chicago, Joliet, Waukegan, Madison, Harvey, Ill.	5.675 *U1,R3, W8,N4,P13*	5.675 *U1,R3, N4,P13,W8* 5.875 *L1*	7.65 *A5, W10,W8, B5,L2,N9*	6.725 *U1,R3, W8*	9.025 *A5, W10,W8, L2,N8,B5*	8.30 *U1,W8, R3*	5.30 *U1,A1, W8,13*	6.375 *U1*	7.50 *U1, W8*	7.95 *U1, W8*	8.00 *A5,R3, W8,N4, K2,W7*
	Cleveland, Elyria, Ohio	5.675 *R3*	5.675 *R3*	7.65 *A5,C13, C18*		9.025 *A5, C13,C18*	8.30 *R3*	5.30 *R3,J3*	6.375 *J3*		7.95 *R3,J3*	8.00 *A5, C13,C18*
	Detroit, Plymouth, Mich.	5.675 *G3*	5.675 *G3*	7.90 *P3* 7.85 *P8B5H2* 7.65 *R5*	6.725 *R5,G3*	9.025 *R5,P8, H2* 9.225 *B5,P3*	8.30 *G3*	5.30 *G3*		7.50 *G3*	7.95 *G3*	
	Duluth, Minn.											8.00 *A5*
	Gary, Ind. Harbor, Crawfordsville, Hammond, Ind.	5.675 *U1,I3, Y1*	5.675 *U1,I3, Y1*	7.65 *R3,J3*	6.725 *U1,I3, Y1*	9.025 *R3,M4*	8.30 *U1,Y1*	5.30 *U1,I3, Y1*	6.375 *J3, Y1*	7.50 *U1, Y1*	7.95 *U1, Y1,I3*	8.10 *M4*
	Granite City, Ill.							5.40 *G2*				
	Kokomo, Ind.		5.775 *C9*									8.10 *C9*
	Sterling, Ill.	5.775 *N4*	5.775 *N4*				7.925 *N4*	5.30 *N4*			7.625 *N4*	8.10 *K2*
	Niles, Warren, Ohio Sharon, Pa.			7.65 *C10*	6.725 *C10,*	9.025 *C10*		5.30 *R3,S1*		7.50 *S1*	7.95 *R3, S1*	
	Owensboro, Ky.	5.675 *G5*			6.725 *G5*							
	Pittsburgh, Midland, Donora, Aliquippa, Pa.	5.675 *U1,J3*	5.675 *U1,J3*	7.65 *A5,B4, R3,J3,C11, W10,S9,C8, M9*	6.725 *U1,J3, C11,B7*	9.025 *A5, W10,R3,S9, C11,C8,M9*	8.30 *U1,J3*	5.30 *U1,J3*	6.375 *U1,J3*	7.50 *U1, J3,B7*	7.95 *U1, J3,B7*	8.00 *A5, J3,P6*
	Portsmouth, Ohio											8.00 *P7*
	Youngstown, Steubenville, O.	5.675 *U1,R3, Y1*	5.675 *U1,R3, Y1*	7.65 *A1,Y1, F2*	6.725 *U1,Y1*	9.025 *Y1,F2*	8.30 *U1,Y1*	5.30 *U1,W5, R3,Y1*		7.50 *Y1*	7.95 *U1,Y1*	8.00 *Y1*
WEST	Emeryville, Fontana, Cal.	6.425 *J5* 6.375 *K1*	6.425 *J5* 6.375 *K1*		7.775 *K1*		9.00 *K1*	6.10 *K1*		8.30 *K1*	8.75 *K1*	
	Geneva, Utah							5.30 *C7*			7.95 *C7*	
	Kansas City, Mo.	5.925 *S2*	5.675 *S2*		6.975 *S2*		8.55 *S2*					8.25 *S2*
	Los Angeles, Torrance, Cal.	6.375 *C7,B2*	6.375 *C7,B2*	9.10 *R3,P14, S12*	7.775 *B2*	11.00 *P14, B5*	9.00 *B2*					8.95 *B2*
	Minnequa, Colo.	6.125 *C6*	6.125 *C6*					6.15 *C6*				8.25 *C6*
	Portland, Ore.	6.425 *O2*	6.425 *O2*									
	San Francisco, Niles, Pittsburg, Cal.	6.375 *C7* 6.425 *B2*	6.375 *C7* 6.425 *B2*				9.05 *B2*					8.95 *C7,C6*
	Seattle, Wash.	6.425 *B2,N6, A10*	6.425 *B2,A10*		7.825 *B2*		9.05 *B2*	6.20 *B2*		8.40 *B2*	8.85 *B2*	
SOUTH	Atlanta, Ga. Jacksonville, Fla.	5.875 *A8*	5.00 *A8*									8.00 *A8* 8.35 *M4*
	Fairfield City, Ala. Birmingham, Ala.	5.675 *T2,R3, C16*	5.675 *T2,R3, C16*	8.25 *C16*			8.30 *T2*	5.30 *T2,R3*			7.95 *T2*	8.00 *T2,R3*
	Houston, Ft. Worth, Lone Star, Texas, Sand Springs, Okla.	5.925 *S2*	5.675 *S2*		6.975 *S2*		8.55 *S2*	5.40 *S2*		7.60 *S2*	8.05 *S2*	8.25 *S2*

† Merchant Quality—Special Quality 35¢ higher. (Effective Apr. 3, 1961) * Special Quality.

STEEL PRICES

Key to Steel Producers

With Principal Offices

A1 Acme Steel Co., Chicago
A2 Alan Wood Steel Co., Conshohocken, Pa.
A3 Allegheny Ludlum Steel Corp., Pittsburgh
A4 American Cladmetals Co., Carnegie, Pa.
A5 American Steel & Wire Div., Cleveland
A6 Angel Nail & Chaplet Co., Cleveland
A7 Armco Steel Corp., Middletown, Ohio
A8 Atlantic Steel Co., Atlanta, Ga.
A9 Acme-Newport Steel Co., Newport, Ky.
A10 Alaska Steel Mills, Inc., Seattle, Wash.

B1 Babcock & Wilcox Tube Div., Beaver Falls, Pa.
B2 Bethlehem Steel Co., Pacific Coast Div.
B3 Bethlehem Steel Co., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin, Inc., Harvey, Ill.
B6 Brooke Plant, Wickwire-Spencer Steel Div., Birdsboro, Pa.
B7 A. M. Byers, Pittsburgh
B8 Braeburn Alloy Steel Corp., Braeburn, Pa.
B9 Barry Universal Corp., Detroit, Mich.

C1 Calstrip Steel Corp., Los Angeles
C2 Carpenter Steel Co., Reading, Pa.
C6 Colorado Fuel & Iron Corp., Denver
C7 Columbia Geneva Steel Div., San Francisco
C8 Columbia Steel & Shafting Co., Pittsburgh
C9 Continental Steel Corp., Kokomo, Ind.
C10 Copperweld Steel Co., Pittsburgh, Pa.
C11 Crucible Steel Co. of America, Pittsburgh
C13 Cuyahoga Steel & Wire Co., Cleveland
C14 Compressed Steel Shafting Co., Readville, Mass.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Div., Birmingham
C18 Cold Drawn Steel Plant, Western Automatic Machine Screw Co., Elyria, O.

D1 Detroit Steel Corp., Detroit
D2 Driver, Wilbur B., Co., Newark, N. J.
D3 Driver Harris Co., Harrison, N. J.
D4 Dickson Weatherproof Nail Co., Evanston, Ill.

E1 Eastern Stainless Steel Corp., Baltimore
E2 Empire-Reeves Steel Corp., Mansfield, O.
E3 Enamel Products & Plating Co., McKeesport, Pa.

F1 Firth Sterling, Inc., McKeesport, Pa.
F2 Fitzsimons Steel Corp., Youngstown
F3 Follansbee Steel Corp., Follansbee, W. Va.

G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Corp., Detroit
G4 Greer Steel Co., Dover, O.
G5 Green River Steel Corp., Owenboro, Ky.

H1 Hanna Furnace Corp., Detroit
H2 Hercules Drawn Steel Corp., Toledo, O.

I2 Ingersoll Steel Div., New Castle, Ind.
I3 Inland Steel Co., Chicago, Ill.
I4 Interlake Iron Corp., Cleveland

J1 Jackson Iron & Steel Co., Jackson, O.
J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Calif.
K2 Keystone Steel & Wire Co., Peoria
K4 Keystone Drawn Steel Co., Spring City, Pa.

L1 Laclede Steel Co., St. Louis
L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.

M1 Mahoning Valley Steel Co., Niles, O.
M2 McLouth Steel Corp., Detroit
M3 Mercer Tube & Mfg. Co., Sharon, Pa.
M4 Mid States Steel & Wire Co., Crawfordsville, Ind.
M7 Milton Steel Products Div., Milton, Pa.
M8 Mill Strip Products Co., Evanston, Ill.
M9 Moltrup Steel Products Co., Beaver Falls, Pa.
M10 Mill Strip Products Co., of Pa., New Castle, Pa.

N1 National Supply Co., Pittsburgh
N2 National Tube Div., Pittsburgh
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N6 Northwest Steel Rolling Mills, Seattle
N7 Newman Crosby Steel Co., Pawtucket, R. I.
N8 Carpenter Steel of New England, Inc., Bridgeport, Conn.
N9 Nelson Steel & Wire Co.

O1 Oliver Iron & Steel Co., Pittsburgh
O2 Oregon Steel Mills, Portland

P1 Page Steel & Wire Div., Monessen, Pa.
P2 Phoenix Steel Corp., Phoenixville, Pa.
P3 Pilgrim Drawn Steel Div., Plymouth, Mich.
P4 Pittsburgh Coke & Chemical Co., Pittsburgh
P6 Pittsburgh Steel Co., Pittsburgh
P7 Portsmouth Div., Detroit Steel Corp., Detroit
P8 Plymouth Steel Co., Detroit
P9 Pacific States Steel Co., Niles, Cal.
P10 Precision Drawn Steel Co., Camden, N. J.
P11 Production Steel Strip Corp., Detroit
P13 Phoenix Mfg. Co., Joliet, Ill.
P14 Pacific Tube Co.
P15 Philadelphia Steel and Wire Corp.

R1 Reeves Steel & Mfg. Div., Dover, O.
R2 Reliance Div., Eaton Mfg. Co., Massillon, O.
R3 Republic Steel Corp., Cleveland
R4 Roebling Sons Co., John A., Trenton, N. J.
R5 Jones & Laughlin Steel Corp., Stainless and Strip Div.
R6 Rodney Metals, Inc., New Bedford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon, Pa.
S2 Sheffield Steel Div., Kansas City
S3 Shenango Furnace Co., Pittsburgh
S4 Simonds Saw and Steel Co., Fitchburg, Mass.
S5 Sweet's Steel Co., Williamsport, Pa.
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S9 Superior Steel Div. of Copperweld Steel Co.
S10 Seneca Steel Service, Buffalo
S11 Southern Electric Steel Co., Birmingham
S12 Sierra Drawn Div., Bliss & Laughlin, Inc., Los Angeles, Calif.
S13 Seymour Mfg. Co., Seymour, Conn.
S14 Screw and Bolt Corp. of America, Pittsburgh, Pa.

T1 Tonawanda Iron Div., N. Tonawanda, N. Y.
T2 Tennessee Coal & Iron Div., Fairfield
T3 Tennessee Products & Chem. Corp., Nashville
T4 Thomas Strip Div., Warren, O.
T5 Timken Steel & Tube Div., Canton, O
T7 Texas Steel Co., Fort Worth
T8 Thompson Wire Co., Boston

U1 United States Steel Corp., Pittsburgh
U2 Universal-Cyclops Steel Corp., Bridgeville, Pa.
U3 Ulbrich Stainless Steels, Wallingford, Conn.
U4 U. S. Pipe & Foundry Co., Birmingham

W1 Wallingford Steel Co., Wallingford, Conn.
W2 Washington Steel Corp., Washington, Pa.
W3 Weirton Steel Co., Weirton, W. Va.
W4 Wheatland Tube Co., Wheatland, Pa.
W5 Wheeling Steel Corp., Wheeling, W. Va.
W6 Wickwire Spencer Steel Div., Buffalo
W7 Wilson Steel & Wire Co., Chicago.
W8 Wisconsin Steel Div., S. Chicago, Ill.
W9 Woodward Iron Co., Woodward, Ala.
W10 Wyckoff Steel Co., Pittsburgh
W12 Wallace Barnes Steel Div., Bristol, Conn.

Y1 Youngstown Sheet & Tube Co., Youngstown, O.

STEEL SERVICE CENTER PRICES

Metropolitan Price, dollars per 100 lb.

Cities	City Delivery; Charge	Sheets			Strip	Plates	Shapes	Bars		Alloy Bars			
		Hot-Rolled (18 ga. & hvr.)	Cold-Rolled (15 gage)	Galvanized (10 gage)††	Hot-Rolled		Standard Structural	Hot-Rolled (merchant)	Cold-Finished	Hot-Rolled 4615 As rolled	Hot-Rolled 4140 Annealed	Cold-Drawn 4615 As rolled	Cold-Drawn 4140 Annealed
Atlanta		9.37	10.61	11.83	10.85	9.73	9.94	9.53	13.24	.....	.....	.....	.....
Baltimore	$.10	7.87	9.71	10.16	11.35	9.70	9.95	8.65	11.80	17.48	16.48	21.58	20.83
Birmingham		8.46	10.20	10.59	9.45	8.41	8.47	8.26	13.14	16.76	16.65	.....	.....
Boston	.10	9.84	10.68	11.87	12.26	9.72	10.26	9.87	13.45	17.79	16.79	21.89	21.14
Buffalo	.15	8.70	9.45	11.40	11.15	8.80	9.30	8.90	11.60	17.45	16.45	21.55	20.80
Chicago**	.15	9.37	10.35	10.85	11.54	9.21	9.72	9.37	10.80	17.10	16.10	21.20	20.45
Cincinnati**	.15	9.53	10.41	10.90	11.86	9.59	10.29	9.48	11.68	17.42	16.42	21.52	20.77
Cleveland**	.15	9.37[1]	10.81	11.07	11.66	9.45	10.11	9.69	11.40	17.21	16.21	21.31	20.56
Denver		11.55	12.53	13.03	13.72	11.39	11.90	11.55	12.98	.....	.....	.....	20.84
Detroit**	.15	9.63	10.61	11.20	11.91	9.58	10.29	9.68	11.16	17.38	16.38	21.48	20.73
Houston**		10.17	10.98	11.35[3]	11.73	9.41	9.81	9.58	13.10	17.50	16.55	21.55	20.85
Kansas City	.15	10.53	11.37	10.95	12.70	10.39	10.91	10.55	11.72	17.17	15.87	21.87	21.12
Los Angeles		10.35[1]	11.20	12.20	12.40	10.30	10.45	10.25	14.20	18.30	17.35	22.90	22.20
Memphis	.15	9.13	10.50	10.95	11.44	9.47	9.82	8.97	12.89	.....	.....	.....	.....
Milwaukee**	.15	9.51	10.49	10.99	11.68	9.35	9.94	9.51	11.04	17.24	16.24	21.24	20.49
New York	.10	9.77	10.23	11.45	11.56	9.61	10.30	9.84	13.35	17.50	16.50	21.60	20.85
Norfolk	.20	8.20	.....	.....	8.90	8.65	9.20	8.90	10.70	.....	.....	.....	.....
Philadelphia	.10	9.90	10.10	10.76	11.35	9.70	9.95	9.75	12.05	17.48	16.48	21.58	20.83
Pittsburgh**	.15	9.37	10.81	11.83	11.64	9.21	9.72	9.37	11.40	17.10	16.10	21.20	20.45
Portland		9.45	11.30	12.35	12.40	10.55	11.00	9.45	16.65	18.60	17.85	22.70	22.15
San Francisco	.10	10.27	11.79[2]	11.50	11.88	10.48	10.50	10.17	15.20	18.30	17.35	22.90	22.20
Seattle		11.35	12.45	13.40	12.80	10.95	11.50	10.80	16.20	18.60	17.85	22.70	22.15
Spokane	.15	11.35	12.45	13.40	12.80	10.95	11.50	10.80	16.35	17.75	17.95	21.58	22.30
St. Louis**	.15	9.57	10.75	11.23	11.74	9.43	9.95	9.59	11.43	17.48	16.48	21.58	20.83
St. Paul	.15	9.72	10.39	11.54	11.89	9.56	10.07	9.72	11.64	.....	16.69	.....	21.04

Base Quantities (Standard unless otherwise keyed): Cold finished bars: 2000 lb or over. Alloy bars: 1000 to 1999 lb. All others: 2000 to 4999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may be combined with each other for quantity. **These cities are on order quantity pricing. Prices shown are for 2000 lb item quantities of the following: Hot-rolled sheet—10 ga. x 36 x 96—120; Cold-rolled sheet—20 ga x 36 x 96—120; Galv. sheet—10 ga x 36—120; Hot-rolled strip—⅜" x 1"; Plate—¼"; x 84"; Shapes—I-Beams 6 x 12.5; Hot-rolled bar—Rounds—⅝-2 15/16; Cold-finished bar—C 1018—1" rounds; Alloy bar—hot-rolled 4615—1⅛" to 2⅞"; cold drawn—15/16" to 2⅞" round; Hot-rolled 4140—⅝" to 2⅞" round. cold drawn—15/16" to 2⅞" round.

†† 13¢ zinc. ‡ Deduct for country delivery. [1] 15 ga. & heavier; [2] 14 ga. & lighter. [3] 10 ga. x 48 — 120.

(Effective Apr. 3, 1961)

PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

Producing Point	Basic	Fdry.	Mall.	Bess.	Low Phos.
Birdsboro, Pa. *B6*	68.00	68.50	69.00	69.50	73.00
Birmingham *R3*	62.00	62.50*	66.50	.....	.....
Birmingham *W9*	62.00	62.50*	66.50	.....	.....
Birmingham *U4*	62.00	62.50*	66.50	.....	.....
Buffalo *R3*	66.00	66.50	67.00	67.50	.....
Buffalo *H1*	66.00	66.50	67.00	67.50	71.50†
Buffalo *W6*	66.00	66.50	67.00	67.50	.....
Chester *P2*	68.00	68.50	69.00	.....	.....
Chicago *I4*	66.00	66.50	66.50	67.00	.....
Cleveland *A5*	66.00	66.50	66.50	67.00	71.00†
Cleveland *R3*	66.00	66.50	66.50	67.00	.....
Duluth *I4*	66.00	66.50	66.50	67.00	71.00†
Erie *I4*	66.00	66.50	66.50	67.00	71.00†
Fontana *K1*	75.00	75.50	.....	.....	.....
Geneva, Utah *C7*	66.00	66.50	.....	.....	.....
Granite City *G2*	67.90	68.40	68.90	.....	.....
Hubbard *Y1*	.....	.....	66.50	.....	.....
Ironton, Utah *C7*	66.00	66.50	.....	.....	73.00
Lyles, Tenn. *T3*	.....	.....	.....	.....	.....
Midland *C11*	66.00	.....	.....	.....	.....
Minnequa *C6*	68.00	68.50	69.00	.....	.....
Monessen *P6*	66.00	.....	.....	.....	.....
Neville Is. *P4*	66.00	66.50	66.50	67.00	71.00†
N. Tonawanda *T1*	.....	66.50	67.00	67.50	.....
Rockwood *T3*	62.00	62.50	66.50	67.00	73.00
Sharpsville *S3*	66.00	.....	66.50	67.00	.....
So. Chicago *R3*	66.00	66.50	66.50	67.00	.....
So. Chicago *W8*	66.00	.....	66.50	67.00	.....
Swedeland *A2*	68.00	68.50	69.00	69.50	71.00†
Toledo *I4*	66.00	66.50	66.50	67.00	.....
Troy, N. Y. *R3*	68.00	68.50	69.00	69.50	73.00
Youngstown *Y1*	.....	.....	66.50	.....	.....

DIFFERENTIALS: Add, 75¢ per ton for each 0.25 pct silicon or portion thereof over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct) 50¢ per ton for each 0.25 pct manganese or portion thereof over 1 pct, $2 per ton for 0.50 to 0.75 pct nickel, $1 for each additional 0.25 pct nickel.

Add $1.00 for 0.31-0.69 pct phos. Add 50¢ per gross ton for truck loading charge.

Silvery Iron: Buffalo (6 pct), *H1*, $79.25; Jackson *J1*, *I4*, Toledo, *I4*, $78.00; Niagara Falls (15.01-15.50), $101.00; Keokuk (14.01-14.50), $89.00; (15.51-16.00), $92.00. Add 75¢ per ton for each 0.50 pct silicon over base (6.01 to 6.50 pct) up to 13 pct; 13 to 13.5 pct; 13.5 to 14 pct, add $1. Add $1.00 for each 0.50 pct manganese over 1.00 pct.

† Intermediate low phos.

FASTENERS

(Base discounts, f.o.b. mill, based on latest list prices)

Hex Screws and All Bolts Including Hex & Hex, Square Machine, Carriage, Lag, Plow, Step, and Elevator

(Discount for 1 container) — Pct

Plain finish—packaged and bulk	46
Hot galvanized and zinc plated—packaged	39.25
Hot galvanized and zinc plated—bulk	46

Nuts: Hexagon and Square, Hex, Heavy Hex, Thick Hex & Square

(Discount for 1 container) — Pct

Plain finish—packaged and bulk	46
Hot galvanized and zinc plated—packaged	39.25
Hot galvanized and zinc plated—bulk	46

Hexagon Head Cap Screws—UNC or UNF Thread—Bright & High Carbon

(Discount for 1 container)

Plain finish—packaged and bulk	46
Hot galvanized and zinc plated—packaged	39.25
Hot galvanized and zinc plated—bulk	46

(On all the above categories add 25 pct for less than container quantities. Minimum plating charge—$10.00 per item. Price on application assembled to bolts.)

Machine Screws and Stove Bolts

(Packages—plain finish)

	Discount Screws	Bolts
Full Cartons	46	46
Machine Screws—bulk		
¼ in. diam or smaller	25,000 pcs	50
5/16, ⅜ & ½ in. diam	15,000 pcs	50

Machine Screw and Stove Bolt Nuts

(Packages—plain finish)

	Discount Hex	Square
Full Cartons	46	57
Bulk		
¼ in. diam or smaller	25,000 pcs	
5/16 or ⅜ in. diam	56	60
	15,000 pcs	
	56	60

Rivets

	Base per 100 *lb*
½ in. diam and larger	$12.85
	Pct Off List
7/16 in. and smaller	15

TOOL STEEL

F.o.b. mill

W	Cr	V	Mo	Co	per lb	SAE
18	4	1	—	—	$1.84	T-1
18	4	1	—	5	2.545	T-4
18	4	2	—	—	2.005	T-2
1.5	4	1.5	8	—	1.20	M-1
6	4	3	6	—	1.59	M-3
6	4	2	5	—	1.345	M-2
High-carbon chromium					.955	D-3, D-5
Oil hardened manganese					.505	O-2
Special carbon					.38	W-1
Extra carbon					.38	W-1
Regular carbon					.325	W-1

Warehouse prices on and east of Mississippi are 4¢ per lb higher. West of Mississippi, 6¢ higher.

LAKE SUPERIOR ORES

51.50% Fe natural, delivered lower Lake ports. Interim prices for 1960 season. Freight changes for seller's account.

	Gross Ton
Openhearth lump	$12.70
Old range, bessemer	11.85
Old range, nonbessemer	11.70
Mesabi, bessemer	11.60
Mesabi, nonbessemer	11.45
High phosphorus	11.45

(Effective Apr. 3, 1961)

STAINLESS STEEL

Base price cents per lb. f.o.b. mill

Product	201	202	301	302	303	304	316	321	347	403	410	416	430
Ingots, reroll.	22.75	24.75	24.00	26.25	—	28.00	41.25	33.50	38.50	—	17.50	—	17.75
Slabs, billets	25.00	28.25	26.00	29.50–32.75	32.00	29.50–34.50	47.50	38.00	46.50	—	19.25–21.50	—	19.75–21.75
Billets, forging	—	37.75	38.75	39.50	42.50	39.50	64.50	48.75	57.75	29.25	29.25	29.75	29.75
Bars, struct.	43.50	44.50	46.00	46.75	49.75	46.75	75.75	57.50	67.25	35.00	35.00	35.50	35.50
Plates	39.25	40.00	41.25	42.25	45.00	45.75	71.75	54.75	64.75	30.00	30.00	31.25–31.75	31.00
Sheets	48.50	49.25	51.25	52.00	56.75	52.00	80.75	65.50	79.25	40.25	40.25	48.25	40.75
Strip, hot-rolled	36.00	39.00	37.25	40.50	—	40.50	68.50	53.50	63.50	—	31.00	—	32.00
Strip, cold-rolled	45.00	49.25	47.50	52.00	56.75	52.00	80.75	65.50	79.25	40.25	40.25	42.50	40.75
Wire CF; Rod HR	—	42.25	43.50	44.25	47.25	44.25	71.75	54.50	63.75	33.25	33.25	33.75	33.75

STAINLESS STEEL PRODUCING POINTS:

Sheets: Midland, Pa., *C11*; Brackenridge, Pa., *A3*; Butler, Pa., *A7*; Vandergrift, Pa., *U1*; Washington, Pa., *W2*, *J2*; Baltimore, *E1*; Middletown, O., *A7*; Massillon, O., *R3*; Gary, *U1*; Bridgeville, Pa., *U2*; New Castle, Ind., *I2*; Detroit, *M2*; Louisville, O., *R5*.

Strip: Midland, Pa., *C11*; Waukegan, Cleveland, *A5*; Carnegie, Pa., *S9*; McKeesport, Pa., *F1*; Reading, Pa., *C2*; Washington, Pa., *W2*; W. Leechburg, Pa., *A3*; Bridgeville Pa., *U2*; Detroit, *M2*; Detroit, *S1*; Canton, Massillon, O., *R3*; Harrison, N. J., *D3*; Youngstown, *R5*; Sharon, Pa., *S1*; Butler, Pa., *A7*; Wallingford, Conn., *U3* (plus further conversion extras); *W1* (25¢ per lb. higher); Seymour, Conn., *S13*, (25¢ per lb. higher); New Bedford, Mass., *R6* Gary, *U1*, (25¢ per lb. higher); Baltimore, Md., *E1* (300 series only).

Bar: Baltimore, *A7*; S. Duquesne, Pa., *U1*; Munhall, Pa., *U1*; Reading, Pa., *C2*; Titusville, Pa., *U2*; Washington, Pa., *J2*; McKeesport, Pa., *U1*, *F1*; Bridgeville, Pa., *U2*; Dunkirk, N. Y., *A3*; Massillon, O., *R5*; S. Chicago, *U1*; Syracuse, N. Y., *C11*; Watervliet, N. Y., *A3*; Waukegan, *A5*; Canton, O., *T5*, *R3*; Ft. Wayne, *I4*; Detroit, *R5*; Gary, *U1*; Owensboro, Ky., *G5*; Bridgeport, Conn., *N8*; Ambridge, Pa., *B7*.

Wire: Waukegan, *A5*; Massillon, O., *R3*; McKeesport, Pa., *F1*; Ft. Wayne, *J4*; Newark, N. J. *D2*; Harrison, N. J., *D3*; Baltimore, *A7*; Dunkirk, *A3*; Monessen, *P1*; Syracuse, *C11*; Bridgeville, *U2*; Detroit, *R5*; Reading, Pa., *C2*; Bridgeport, Conn., *N8* (down to and including ¼").

Structurals: Baltimore, *A7*; Massillon, O., *R3*; Chicago, Ill., *J4*; Watervliet, N. Y., *A3*; Syracuse, *C11*; S. Chicago, *U1*.

Plates: Ambridge, Pa., *B7*; Baltimore, *E1*; Brackenridge, Pa., *A3*; Chicago, *U1*; Munhall, Pa., *U1*; Midland, Pa., *C11*; New Castle, Ind., *I2*; Middletown, *A7*; Washington, Pa., *J2*; Cleveland, Massillon, *R3*; Coatesville, Pa., *C15*; Vandergrift, Pa., *U1*; Gary, *U1*.

Forging billets: Ambridge Pa., *B7*; Midland Pa., *C11*; Baltimore, *A7*; Washington, Pa., *J2*; McKeesport, *F1*; Massillon, Canton, O., *R3*; Watervliet, *A3*; Pittsburgh, Chicago, *U1*; Syracuse, *C11*; Detroit, *R5*; Munhall, Pa., S. Chicago, *U1*; Owensboro, Ky., *G5*; Bridgeport, Conn., *N8*; Reading, Pa., *C2*.

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard & Coated Nails	Woven Wire Fence	"T" Fence Posts	Single Loop Bale Ties	Galv. Barbed and Twisted Barbless Wire	Merch. Wire Ann'ld ¢/lb.	Merch. Wire Galv. ¢/lb.
	Col	Col	Col	Col	Col		
Alabama City *R3*	173	187	...	212	193	9.00	9.55
Aliquippa *J3***	173	190	...	...	190	9.00	9.675
Atlanta *A8***	173	191	...	212	197	9.00	9.75
Bartonville *K2***	175	193	183	214	199	9.10	9.85
Buffalo *W6*	.....	.....	.....	.....	.....	9.00	9.55*
Chicago *N4*	173	191	177	212	197	9.00	9.75
Chicago *R3*	.....	.....	.....	.....	.....	9.00	9.55
Chicago *W7*	173	.....	.....	.....	.....	9.00	9.55†
Cleveland *A6*	.....	.....	.....	.....	.....	.....	.....
Cleveland *A5*	.....	.....	.....	.....	.....	9.00	.....
Crawf'dav. *M4***	175	192	...	214	198	9.10	9.80
Donora Pa. *A5*	173	187	...	212	193	9.00	9.55
Duluth *A5*	173	187	177	212	193	9.00	9.55
Fairfield, Ala. *T2*	173	187	...	212	193	9.00	9.55
Galveston *D4*	9.10‡	.....	.....	.....	.....	.....	.....
Houston *S2*	178	192	...	217	198	9.25	9.80†
Jacksonville *M4*	175	192	...	214	198	9.10	9.80††
Johnstown *B3***	173	190	177	...	196	9.00	9.675
Joliet Ill. *A5*	173	187	...	212	193	9.00	9.55
Kokomo *C9**	175	189	...	214	195*	9.10	9.65*
L. Angeles *B2****	.....	.....	.....	.....	.....	9.95	10.625
Kansas City *S2**	178	192	...	217	198*	9.25	9.80†
Minnequa *C6*	178	192	182	217	198†	9.25	9.80†
Palmer, Mass *W6*	.....	.....	.....	.....	.....	9.30	9.85*
Pittsburg, Cal. *C7*	192	210	.....	.....	213	9.95	10.50
Rankin Pa. *A5*	173	187	.....	.....	193	9.00	9.55
So. Chicago *R3*	173	187	.....	.....	193	8.65	9.20
S. San Fran. *C6*	.....	.....	.....	236	.....	9.95	10.50
Sparrows Pt. *B3***	175	.....	.....	215	198	9.10	9.775
Struthers, O. *Y1**	.....	.....	.....	.....	.....	8.65	9.20
Worcester *A5*	179	.....	.....	.....	.....	9.30	9.85
Williamsport *S5*	.....	.....	.....	.....	.....	.....	.....

* Zinc less than .10¢. *** .10¢ zinc.
** 13-13.5¢ zinc. † Plus zinc extras.
‡ Wholesalers only. †† 0.115¢ zinc.

PIPE AND TUBING

Base discounts (pct) f.o.b. mills. Base price about $280 per net ton.

STANDARD T. & C.	BUTTWELD														SEAMLESS							
	½ In.		¾ In.		1 In.		1¼ In.		1½ In.		2 In.		2½-3 In.		2 In.		2½ In.		3 In.		3½-4 In.	
	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.
Sparrows Pt. *B3*	0.25	*15.0	3.25	*11.0	6.75	*6.50	9.25	*5.75	9.75	*4.75	10.25	*4.25	11.75	*4.50								
Youngstown *R3*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50								
Fontana *K1*	*10.75	*26.00	*7.75	*22.00	*4.25	*17.50	*1.75	*16.75	*1.25	*15.75	*0.75	*15.25	0.75	*15.50								
Pittsburgh *J3*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50	*12.25	*27.25	*5.75	*22.50	*3.25	*20.0	*1.75	*18.50
Alton, Ill. *L1*	0.25	*15.0	3.25	*11.0	6.75	*6.50	9.25	*5.75	9.75	*4.75	10.25	*4.25	11.75	*4.50								
Sharon *M3*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50								
Fairless *N2*	0.25	*15.0	3.25	*11.0	6.75	*6.50	9.25	*5.75	9.75	*4.75	10.25	*4.25	11.75	*4.50								
Pittsburgh *N1*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50	*12.25	*27.25	*5.75	*22.50	*3.25	*20.0	*1.75	*18.50
Wheeling *W5*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50								
Wheatland *W4*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50								
Youngstown *Y1*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50	*12.25	*27.25	*5.75	*22.50	*3.25	*20.0	*1.75	*18.50
Indiana Harbor *Y1*	1.25	*14.0	4.25	*10.0	7.75	*5.50	10.25	*4.75	10.75	*3.75	11.25	*3.25	12.75	*3.50								
Lorain *N2*	2.25	*13.0	5.25	*9.0	8.75	*4.50	11.25	*3.75	11.75	*2.75	12.25	*2.25	13.75	*2.50	*12.25	*27.25	*5.75	*22.50	*3.25	*20.0	*1.75	*18.50
EXTRA STRONG PLAIN ENDS																						
Sparrows Pt. *B3*	4.75	*9.0	8.75	*5.0	11.75	*0.50	12.25	*1.75	12.75	*0.75	13.25	*0.25	13.75	*1.50								
Youngstown *R3*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50								
Fairless *N2*	4.75	*9.0	8.75	*5.0	11.75	*0.50	12.25	*1.75	12.75	*0.75	13.25	*0.25	13.75	*1.50								
Fontana *K1*	*6.25		*2.25		0.75		1.25		1.75		2.25		2.75									
Pittsburgh *J3*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	*10.75	*24.75	*3.25	*19.0	*0.75	*16.50	4.25	*11.50
Alton, Ill. *L1*	4.75	*9.0	8.75	*5.0	11.75	*0.50	12.25	*1.75	12.75	*0.75	13.25	*0.25	13.75	*1.50								
Sharon *M3*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50								
Pittsburgh *N1*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	*10.75	*24.75	*3.25	*19.0	*0.75	*16.50	4.25	*11.50
Wheeling *W5*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50								
Wheatland *W4*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50								
Youngstown *Y1*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	*10.75	*24.75	*3.25	*19.0	*0.75	*16.50	4.25	*11.50
Indiana Harbor *Y1*	5.75	*8.0	9.75	*4.0	12.75	0.50	13.25	*0.75	13.75	0.25	14.25	0.75	14.75	*0.50								
Lorain *N2*	6.75	*7.0	10.75	*3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	*10.75	*24.75	*3.25	*19.0	*0.75	*16.50	4.25	*11.50

Threads only, buttweld and seamless, 2¼ pt. higher discount. Plain ends, buttweld and seamless, 3-in. and under, 5½ pt. higher discount.

Galvanized discounts based on zinc price range of over 9¢ to 11¢ per lb. East St. Louis. For each 2¢ change in zinc, discounts vary as follows: ½, ¾ and 1-in., 2 pt.; 1¼, 1½ and 2-in., 1½ pt.; 2½ and 3-in., 1 pt., e.g., zinc price range of over 13¢ to 15¢ would lower discounts on 2½ and 3-in. pipe by 2 points; zinc price in range over 7¢ to 9¢ would increase discounts. East St. Louis zinc price now 11.50¢ per lb.

CAST IRON WATER PIPE INDEX

Birmingham	125.8
New York	138.6
Chicago	140.0
San Francisco-L. A.	148.6

[1] Dec. 1955, value, Class B or heavier 5 in. or larger, bell and spigot pipe. Explanation: p. 57, Sept. 1, 1955, issue. Source: U. S. Pipe and Foundry Co.

COKE

Furnace, beehive (f.o.b.)	Net-Ton
Connellsville, Pa.	$14.75 to $15.50
Foundry, beehive (f.o.b.)	$18.50
Foundry oven coke	
Buffalo, del'd	$33.25
Chattanooga, Tenn.	30.80
Ironton, O., f.o.b.	30.50
Detroit, f.o.b.	32.00
New England, del'd	33.55
New Haven, f.o.b.	31.00
Kearny, N. J., f.o.b.	31.25
Philadelphia, f.o.b.	31.00
Swedeland, Pa., f.o.b.	31.00
Painesville, Ohio, f.o.b.	32.00
Erie, Pa., f.o.b.	32.00
St. Paul, f.o.b.	31.25
St Louis, f.o.b.	33.00
Birmingham, f.o.b.	30.35
Milwaukee, f.o.b.	32.00
Neville Is., Pa.	30.75

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303G North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2303-G NORTH 11TH ST., ST. LOUIS 6, MO.

GOSS and DE LEEUW
MULTIPLE SPINDLE
CHUCKING MACHINES
Tool Rotating
GOSS & DE LEEUW MACHINE CO., KENSINGTON, CONN.

SILVER PLATING on the job

EASILY APPLIED

Cool-Amp can be applied on the job. The only equipment needed is a clean rag, a wire brush and some water. Cool-Amp contains no cyanide and can be used in underground vaults, substations and hard to get at places by several persons at the same time.

REDUCES RESISTANCE

Cool-Amp Powder deposits a genuine coat of silver that will not peel off. It prevents oxidation, minimizes overheating, thereby reducing maintenance. Provides cool maximum conductivity for all copper, brass or bronze current-carrying connections.

FREE SAMPLE—Write today for informative folder and free sample of Cool-Amp. One pound will silver plate approximately 6,000 square inches. $13.50 per pound—Shipped prepaid.

The COOL-AMP Co.
Dept. IA, 8603 S. W. 17th Avenue, Portland 19, Oregon

RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb	No. 1 Std. Rails	Light Rails	Joint Bars	Track Spikes	Tie Plates	Track Bolts Untreated
Bessemer *U1*	5.75	6.725	7.25	.....	.....	.....
Cleveland *R3*	.....	.....	.....	10.10	.....	15.35
So. Chicago *R3*	.....	.....	.....	.....	.....	.....
Ensley *T2*	5.75	6.725	.....	10.10	6.875	.....
Fairfield *T2*	.....	6.725	.....	.....	6.875	.....
Gary *U1*	5.75	.....	.....	.....	6.875	.....
Huntington, *C16*	.....	6.725	.....	.....	.....	.....
Ind. Harbor *I3*	.....	.....	.....	10.10	.....	.....
Johnstown *B3*	.....	6.725	.....	.....	.....	.....
Joliet *U1*	.....	.....	7.25	.....	.....	.....
Kansas City *S2*	.....	.....	.....	10.10	.....	15.35
Lackawanna *B3*	5.75	6.725	7.25	.....	6.875	.....
Lebanon *B3*	.....	.....	7.25	.....	.....	15.35
Minnequa *C6*	5.75	7.225	7.25	10.10	6.875	15.35
Pittsburgh *S14*	.....	.....	.....	.....	.....	15.35
Pittsburgh *J3*	.....	.....	.....	10.10	.....	.....
Seattle *B2*	.....	.....	.....	.....	6.75	15.85
Steelton *B3*	5.75	.....	7.25	.....	6.875	.....
Struthers *Y1*	.....	.....	.....	10.10	.....	.....
Torrance *C7*	.....	.....	.....	.....	6.75	.....
Williamsport *S5*	.....	6.725	.....	.....	.....	.....
Youngstown *R3*	.....	.....	.....	10.10	.....	.....

C-R SPRING STEEL

Cents Per Lb F.o.b. Mill	CARBON CONTENT 0.26-0.40	0.41-0.60	0.61-0.80	0.81-1.05	1.06-1.35
Anderson, Ind. *G4*	9.10	.....	.....	.....	.....
Baltimore, Md. *T8*	9.50	10.70	12.90	15.90	18.85
Bristol, Conn. *W12*	.....	10.70	12.90	16.10	19.30
Boston *T8*	9.50	10.70	12.90	15.90	18.85
Buffalo, N. Y. *R7*	8.95	10.40	12.60	15.60	18.55
Carnegie, Pa. *S9*	8.95	10.40	12.60	15.60	18.55
Cleveland *A5*	8.95	10.40	12.60	15.60	18.55
Dearborn *S1*	9.05	10.50	12.70	.....	.....
Detroit *D1*	9.05	10.50	12.70	15.70	.....
Detroit *D2*	9.05	10.50	12.70	.....	.....
Dover, O. *G4*	8.95	10.40	12.60	15.60	18.55
Evanston, Ill. *M8*	9.05	10.40	12.60	15.60	.....
Franklin Park, Ill. *T8*	9.05	10.40	12.60	15.60	18.55
Harrison, N. J. *C11*	.....	.....	12.90	16.10	19.30
Indianapolis *R3*	9.10	10.55	12.60	15.60	18.55
Los Angeles *C1*	11.15	12.60	14.80	17.80	.....
New Britain, Conn. *S7*	9.40	10.70	12.90	15.90	18.85
New Castle, Pa. *B4*	8.95	10.40	12.60	15.60	.....
New Castle, Pa. *M10*	8.95	10.40	12.60	15.60	.....
New Haven, Conn. *D1*	9.40	10.70	12.90	15.90	.....
Pawtucket, R. I. *N7*	9.50	10.70	12.90	15.90	18.85
Riverdale, Ill. *A1*	9.05	10.40	12.60	15.60	18.55
Sharon, Pa. *S1*	8.95	10.40	12.60	15.60	18.55
Trenton, *R4*	.....	10.70	12.90	16.10	19.30
Warren, Ohio *T4*	8.95	10.40	12.60	15.60	18.75
Worcester, Mass. *A5*	9.50	10.70	12.90	15.90	18.85
Youngstown *R3*	9.10	10.55	12.60	15.60	18.55

ELECTROPLATING SUPPLIES

Anodes

(Cents per lb, frt allowed in quantity)

Copper

- Rolled elliptical, 18 in. or longer, 5000 lb lots 42.50
- Electrodeposited, 5000 lb lots ... 35.50
- OFHC anodes ..... 40.50 to 43.50 (depending on shape)

Brass, 80-20, ball anodes, 2000 lb or more 50.50

Zinc, ball anodes, 2000 lb lots 18.75
(for elliptical add 1¢ per lb)

Nickel, 99 pct plus, rolled carbon, 5000 lb 1.0225
(Rolled depolarized add 3¢ per lb)

Cadmium, 5000 lb 1.50

Tin, ball anodes $1.05 per lb (approx.).

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum, N. Y.. 65.90

Copper sulphate, 25.2 Cu min, 6000 lbs per cwt, Detroit 17.45

Nickel sulfate, 5000 lbs 29.00

Nickel chloride, freight allowed, 100 lb 45.00

Sodium cyanide, domestic, f.o.b. Chicago, 200 lb drums 24.00

Zinc cyanide, 100 lb, N. Y. 60.75

Potassium cyanide, 100 lb drum N. Y. 45.50

Chromic acid, flake type, 10,000 lb or more, N. Y. 30.44

METAL POWDERS

(Cents per lb, f.o.b. shipping point for ton lots or over, except as noted)

Iron Powders

Molding grade, domestic and foreign, 98 pct Fe, 100 mesh bags, freight allowed east of Miss. R.	11.50
Electrolytic Iron, melting stock, 99.87 pct Fe, truckload lots	25.75
Carbonyl Iron (200 lb lots)	88.00
Welding Grades	8.10
Cutting and Scarfing Grades	9.85
Hydrogen reduced, domestic	11.25

Copper Powders

Molding Grades	
Electrolytic, domestic, f.o.b. shipping point.	15.00†
Atomized	42.3 to 60.3
Reduced	15.00†
Chemically Precipitated	43.5
Brass, 5000-lb lots	32.3 to 48.9
Bronze, 5000-lb lots	50.3 to 54.2
Chromium, electrolytic	5.00
Lead	7.50†
Manganese, electrolytic ...	$1.00
Molybdenum	$3.60 to $4.35
Nickel	$1.15
Carbonyl Nickel, 20,000 lb lots	$1.01
Nickel-Silver, 5000 lb lots..	57.9 to 65.9
Silicon	70.00
Solder	7.00†
Stainless Steel, 316	$1.07
Stainless steel 304	89.00
Tin	14.00†
Titanium, 99.25 + pct, per lb, f.o.b.	$11.25
Tungsten, carbide grades...	$3.25
Zinc	19.5 to 32.7

† Plus cost of metal.

ELECTRICAL SHEETS

22-Gage F.o.b. Mill Cents Per Lb	Hot-Rolled (Cut Lengths)*	Cold-Reduced (Coiled or Cut Length) Semi-Processed	Fully Processed
Field	.....	9.875	.....
Armature	11.70	11.20	11.70
Elect.	12.40	11.90	12.40
Special Motor	.....	12.475	.....
Motor	13.55	13.05	13.55
Dynamo	14.65	14.15	14.65
Trans. 72	15.70	15.20	15.70
Trans. 65	16.30	Grain Oriented	
Trans. 58	16.80	Trans. 80	19.70
Trans. 52	17.85	Trans. 73	20.20
		Trans. 66	20.70

Producing points: Aliquippa (*J3*); Beech Bottom (*W5*); Brackenridge (*A3*); Granite City (*G2*)· Indiana Harbor (*I3*); Mansfield (*E2*); Newport, Ky. (*A9*); Niles, O. (*S1*); Vandergrift (*U1*); Warren, O. (*R3*); Zanesville, Butler (*A7*).

CLAD STEEL

Base prices, cents per lb f.o.b.

	Cladding	Plate (*L4, P2, A3, J2*) 10 pct	15 pct	20 pct	Sheet (*I2*) 20 pct
Stainless Type	302	.....	.....	.....	37.50
	304	28.80	31.55	34.30	40.00
	316	42.20	46.25	50.25	58.75
	321	34.50	37.75	41.05	47.25
	347	40.80	44.65	48.55	57.00
	405	24.60	26.90	29.25	.....
	410	22.70	24.85	27.00	.....
	430	23.45	25.65	27.90	.....

CR Strip (S9) Copper, 10 pct, 2 sides, $43.00; 1 side, $36.10.

(Effective Apr. 3, 1961)

REFRACTORIES

Fire Clay Brick

	Carloads per 1000
Super duty, Mo., Pa., Md., Ky....	$185.00
High duty (except Salina, Pa., add $5.00)	140.00
Medium duty	125.00
Low duty (except Salina, Pa., add $2.00)	103.00
Ground fire clay, net ton, bulk...	22.50

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$158.00
Childs, Hays	163.00
Chicago District	168.00
Western Utah	183.00
California	185.00
Super Duty Hays, Pa., Athens, Tex., Windham, Warren, O.	163.00-168.00
Silica cement, net ton, bulk, Chicago	26.75
Silica cement, net ton, bulk, Ensley, Ala.	27.75
Silica cement, net ton, bulk, Mt. Union, Pa.	25.75
Silica cement, net ton, bulk, Utah and Calif.	39.00

Chrome Brick

Standard chemically bonded, Baltimore, Md.	$620.00
Gary, Ind.	658.50
Standard, Pascagoula, Miss.	647.50
Standard chemically bonded, Curtiner, Calif.	119.00
Burned, Baltimore	585.00

Magnesite Brick

Standard, Baltimore	$715.00
Chemically bonded, Baltimore	655.00
Chemically bonded, Pascagoula, Miss.	682.50

Grain Magnesite

St. ⅜ to ½-in. grains

	Per net ton
Domestic, f.o.b. Baltimore in bulk.	$73.00
Domestic, f.o.b., Pascagoula, Miss...	80.00
Domestic, f.o.b. Chewalah, Wash., Luning, Nev. in bulk	46.00
in sacks	52.00-54.00

Dead Burned Dolomite

F.o.b. bulk, producing points in: Pa., W. Va., Ohio	$16.75
Missouri Valley	15.60
Midwest	17.00

ELECTRODES

Cents per lb. f.o.b. plant, threaded, with nipples, unboxed.

GRAPHITE Diam. (In.)	Length (In.)	Price	CARBON* Diam. (In.)	Length (In.)	Price
24	84	27.25	40	100,110	12.50
20	72	26.50	35	110	11.20
18	72	27.50	30	110	11.70
14	72	27.25	24	72	11.95
12	72	28.25	20	90	11.55
10	60	29.50	17	72	12.10
10	48	30.00	14	72	12.55
7	60	29.75	10	60	13.80
6	60	33.25	8	60	14.25
4	40	37.00			
3	40	39.25			
2½	30	41.50			
2	24	64.00			

* Prices shown cover carbon nipples.

BOILER TUBES

$ per 100 ft. carload lots cut 10 to 24 ft. F.o.b. Mill	Size OD-In.	Size B.W. Ga.	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
Babcock & Wilcox..	2	13	40.28	47.21	35.74
Jones & Laughlin *	2½	12	54.23	63.57	48.13
	3	12	62.62	73.40	55.59
	3½	11	73.11	85.70	65.84
	4	10	97.08	113.80	88.10
National Tube.....	2	13	40.28	47.21	35.74
	2½	12	54.23	63.57	48.13
	3	12	62.62	73.40	55.59
	3½	11	73.11	85.70	65.84
	4	10	97.08	113.80	88.10
Pittsburgh Steel...	2	13	40.28	47.21	.....
	2½	12	54.23	63.57	.....
	3	12	62.62	73.40	.....
	3½	11	73.11	85.70	.....
	4	10	97.08	113.80	.....

* Electricweld only.

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1—1500 HP DC MOTOR 600 V. 600 RPM Whse. M.G. Set. 1500 K.W. G.E. 13,200 V.
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Pickup Underway In Cincinnati

Used machinery dealers in the Cincinnati area are finally pulling out of the current lull.

The sales emphasis is on tools for research projects and rebuilt machines for production. Inquiries are coming more frequently.

■ Used machinery dealers in the Cincinnati area are climbing a two-runged ladder from the depths of the current lull. The rungs: Used tools for research projects; rebuilt machines for production.

And it appears the lull may soon be gone. Dealers say the volume of inquiries indicates a stronger year than in 1960.

Henry A. Bender, general manager, Cincinnati Machinery Co., says "We are selling quite a few machine tools for use in research work by chemical companies, glass-making plants and for other non-production uses."

Real Bargain—He notes: "These companies find that used machines are a real bargain for their laboratory purposes. They compare the cost with new machines which would not be fully used anyway.

"We are also doing considerable rebuilding work now for big companies that don't want to invest in new tools. Replacing old softer machines with new hardened ones is a major area of activity for us. Many of the older tools were bought with soft ways. After years of use in the same spot, they are worn out. We either plane them down or replace them with new hardened ways. This gives them a new lease on life."

In Demand—The machines most in demand in the general southern Ohio area are large surface grinders, milling machines, and small vertical mills for tool and die shops.

"We are noticing an awful heavy volume of inquiries in the past few months. But it takes a long time to develop a sale from them," says Mr. Bender.

"In our follow-ups we find that the inquiries are made by companies bidding on a specific job rather than any overall modernization or replacement programs. So, whoever gets the job goes out and buys the machines for it. It sure generates a lot of activity and it indicates to us that this year should show a significant increase over last year."

Good Inventories—Used tool inventories in this area are, say dealers, the best they've been in years. Used tool men say it is definitely a buyers' market.

Two current pieces at Cincinnati Machinery are a 96-in. American shaft duplicating machines priced at $21,500, and an 8-ft Fosdick radical drill for $17,000.

The rebuilt 1950 shaft duplicator has a tracer and stylus. It also has a 20-in. swing and new hardened ways. An equivalent new machine would sell for nearly $37,000.

The special radical drill was built in World War II. It has a custom base that weighs 53 tons alone. It also has a 30-in. spacer between the base and the column. Because of all the special custom building, the equivalent new machine of this type would probably cost around $100,000. Therefore, this unit is selling used for less than one-fifth the price of a new tool.

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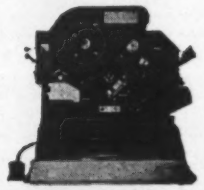

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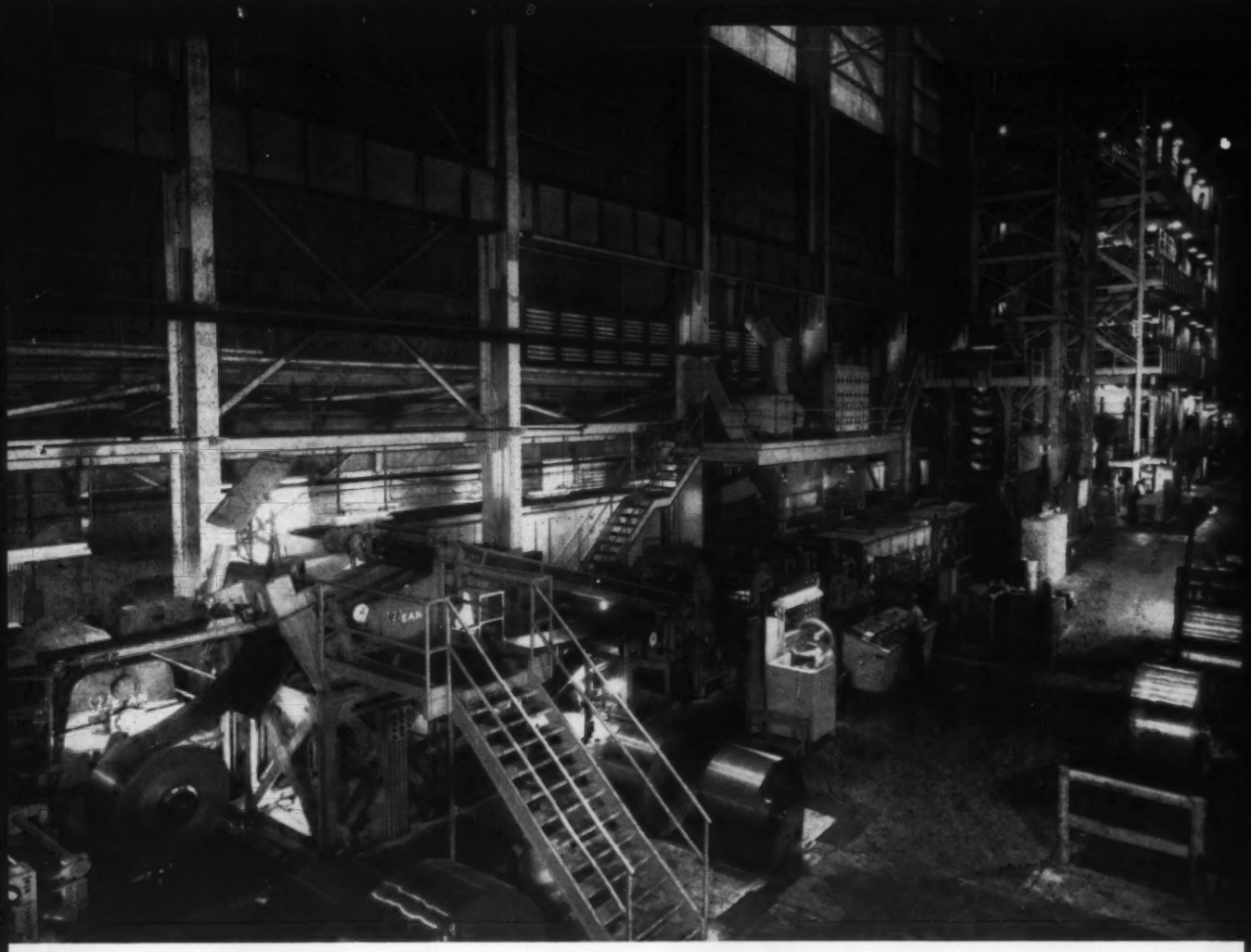


J&L adds modern Wean Annealing Line as major part of tin plate expansion

Recently installed at Jones & Laughlin Steel Corporation's Aliquippa, Pennsylvania plant, this high-speed continuous annealing line represents a major step in J&L's tin plate expansion program. The line is designed to operate at speeds up to 2000 fpm, and it can handle coils weighing up to 50,000 lb with a maximum O.D. of 85".

Strip tension is controlled within the major zones of the line by six precision bridles. The bridle controls are interlocked to provide optimum operating tensions in the looping towers, cleaning zone and furnace. This accurate tension control, coupled with other design features, assures positive tracking of the strip throughout the length of the line.

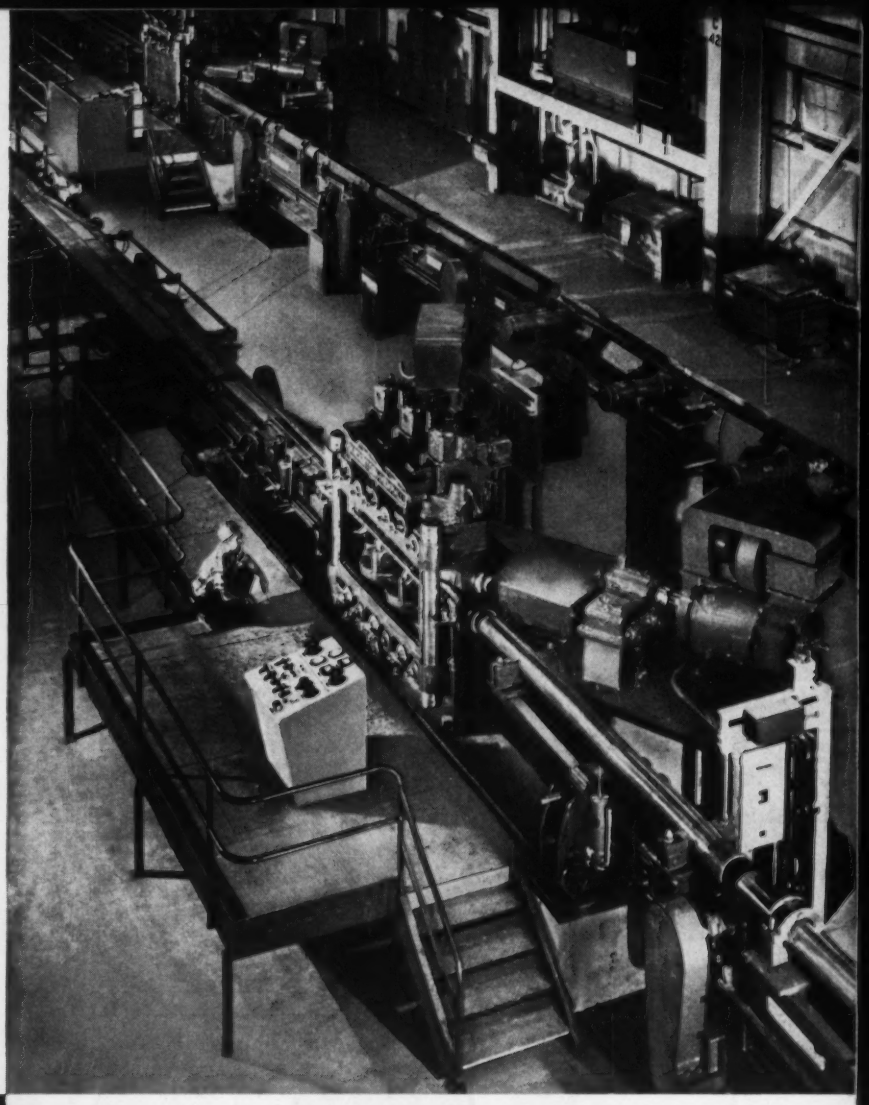
Off-gauge end scrap is removed at the entry end of the line by a novel system of shifting uncoilers, with a scrap reel located outside of the line. Short sections of scrap are joined by a traversing spot welder in order to build up coils, which facilitates scrap handling.

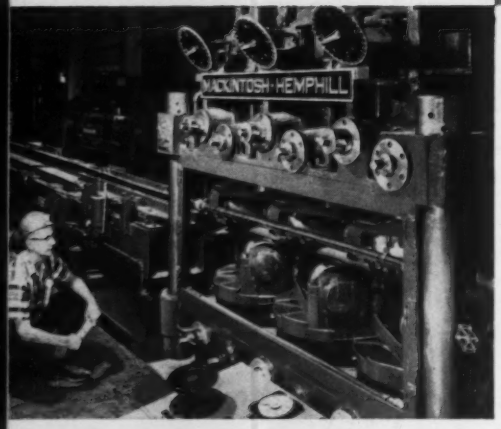
Thirty-one years of partnership with the steel industry and specialization in continuous steel processing facilities give Wean pre-eminent experience in this field. Whether your planning involves tin plate processing, galvanizing, cleaning or pickling facilities, Wean will be able to "creatively engineer" the equipment to meet your requirements.

WEAN

THE WEAN ENGINEERING COMPANY, INC. • WARREN, OHIO

Why Mack-Hemp straighteners were selected for the world's most modern continuous weld pipe mill





The new continuous pipe mill at Lorain Works of U.S. Steel's National Tube Division is probably the most productive facility of its kind in the world, exceeding the record-breaking pipe mill at Fairless Works.

With straightness and roundness of delivered pipe more critical than ever, the Lorain Works assigns this important finishing task to two Mackintosh-Hemphill 6-roll guideless rotary straighteners. The two can process 1800 feet of pipe per minute. Finished pipe is perfectly straight and round, without spiral markings. "End hooks" at back and front are completely removed. Moreover, the straighteners' open three-post construction makes the rolls readily accessible, so that set-up time is cut to a minimum.

If you're concerned with straightening pipe or tube—no matter what the diameter or wall thickness—it will pay you to talk to Mack-Hemp. We have helpful information for you.

MACKINTOSH-HEMPHILL DIVISION PITTSBURGH, U.S.A.

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